



# AMD Processor Performance Evaluation Guide

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# Revision History

Date	Revision	Description
June 2004	3.50	<p>Updated to reflect the AMD Athlon™ 64 FX-53 (939) processor and the 3700+ and 3800+ processors relative to the Intel Pentium® 4 Extreme Edition 3.4 GHz and the Pentium 4 3.4 GHz processors.</p> <p>Removed obsolete processor information.</p> <p>Added the following tests to the Performance Analysis test suite:</p> <ul style="list-style-type: none"> <li>• Table 51, "Panorama Factory Ver. 3.1 64-Bit Benchmark" on page 69</li> <li>• Table 52, "Crafty Factory Ver. 19.12 64-Bit Benchmark" on page 69</li> <li>• Table 83, "Panorama Factory Ver. 3.1 32-Bit Benchmark" on page 80</li> <li>• Table 84, "Crafty Ver. 19.12 32-Bit Benchmark" on page 80</li> </ul>
March 2004	3.43	Updated legal attribution for various benchmarks.
March 2004	3.41	<p>Updated the following charts and corresponding tables:</p> <ul style="list-style-type: none"> <li>• Table 35 on page 63</li> <li>• Table 45 on page 66</li> <li>• Table 69 on page 75</li> <li>• Table 72 on page 76</li> <li>• Table 77 on page 78</li> </ul>
March 2004	3.40	<p>Replaced the obsolete AMD Athlon™ 64 FX-51 processor information with the AMD Athlon 64 FX-53 processor. This change affects Table 3 on page 22 and each benchmark result.</p> <p>Replaced the older Intel Pentium® 4 3.2 GHz configuration and performance data with the Intel Pentium 4 3.2 GHz Extreme Edition Processor. This change affects Table 4 on page 23 and each benchmark result.</p> <p>Replaced the benchmark result tables with graphs and corresponding tables.</p>

Date	Revision	Description
January 2004	3.32	Corrected instructions for "Ziff Davis Media Inc.'s Business Winstone® 2004 v1.0" on page 34, "Ziff Davis Media, Inc.'s Business Multitasking Winstone® 2004 v1.0" on page 35 and "Ziff Davis Media Inc.'s Content Creation Winstone® 2004" on page 36.  Moved 64-Bit performance results from non-optimized rows to optimized rows in Table 7 on page 49 and Table 8 on page 51.
January 2004	3.31	Updated performance results for Table 7 on page 49 and Table 8 on page 51.  Corrected minor typos throughout.
December 2003	3.30	Updated to reflect 3400+ launch.  Figure 3 was removed.  Additional instructions were added for the DivX Encoder for 64-Bit installation and run. Now refer to "DivX Encoder" on page 57.
December 2003	3.25	Removed Revision bars.
December 2003	3.24	On Page 14, removed references to WinACE, because it is no longer tested.  Within "Operating System Configuration" on page 28, added instructions to skip steps 12 and 13 because they do not apply if Microsoft® Windows® is not yet installed. Instead, skip to step 14.  On page 30 added notations that ASUS and MSI drivers are applicable only to their respective motherboards.
December 2003	3.23	Updated benefits for 64-bit processing in "64-bit processing" on page 15.  Corrected attribution in "Digital Media" on page 20.
November 2003	3.22	Added figure label to Figure 3 on page 46. Corrected two column format balancing in various locations.
November 2003	3.21	Applied new document template.
October 2003	3.2	Revision to Table 3 on page 22 to correct memory manufacturer.  Revision to update configuration steps for To install the video clip to use for DivX Encoder on page 45.
September 2003	3.1	Revision to include NVIDIA video driver and ASUS chipset installation.
September 2003	3.0	Initial Public Release

# About This Document

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This document is intended for use by those, particularly in the hardware review community, who are interested in evaluating AMD64 performance, as demonstrated by the AMD Athlon™ 64 and AMD Athlon 64 FX processors.

## Introduction

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This document describes AMD's method of performing processor performance evaluation, and details the steps taken to arrive at the results posted on the web.

## Audience

This document is intended for use by those, particularly in the hardware review community, who are interested in evaluating AMD64 technology performance, as demonstrated by the AMD Athlon 64 and AMD Athlon 64 FX family of processors.

## Life of Document

This document is intended for use when comparing the AMD Athlon 64 model 3700+, 3800+, and the AMD Athlon™ 64 FX-53 processors against processors available from other vendors at the time of publication of this document. As new speed grades become available, this document may become obsolete, or revised as necessary.

# AMD64 Processor Architecture

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Optimal benchmarking of AMD's processors does not require detailed knowledge of processor or system architecture. However, knowledge of the benefits of AMD64 processor-based systems will help enable benchmarks to show the different ways of how this processor performs relative to its competition. AMD designed a 64-bit PC processor that offers industry-leading performance and native compatibility with current 32-bit applications. Architectural improvements specifically designed to increase instructions per clock (IPC) include:

- **AMD64 Technology**

When utilizing the AMD64 Instruction Set Architecture, 64-bit mode is designed to offer:

- Support for 64-bit operating systems to provide full, transparent, and simultaneous 32-bit and 64-bit platform application multitasking.
  - A physical address space that can support systems with up to one terabyte of installed RAM, shattering the 4 gigabyte RAM barrier present on current x86 implementations.
  - Sixteen 64-bit general-purpose integer registers that quadruple the general purpose register space available to applications and device drivers.
  - Sixteen 128-bit XMM registers for enhanced multimedia performance to double the register space of current SSE/SSE2 implementations.
- **Integrated DDR memory controller**, as shown in Figure 1 on page 16.
    - This feature allows for a reduction in memory latency, thereby increasing overall system performance.
    - Benchmarks like Business Winstone<sup>®</sup> and WinRAR Data compression, and AquaMark3 will all help show the benefit of reduced latency.
  - **An advanced HyperTransport<sup>™</sup> link**, as shown in Figure 2 on page 17.
    - This feature dramatically improves the I/O bandwidth, enabling much faster access to peripherals such as hard drives, USB 2.0, and Gigabit Ethernet cards.
    - HyperTransport technology enables benchmark programs like Business Winstone and WinRAR Data compression to illustrate higher processor performance due to a reduced I/O interface throttle.

- Very large level one (L1) and level 2 (L2) on-die cache.
  - With 128 kbytes of L1 cache and 1 Mbyte of L2 cache, the AMD Athlon 64 processor is able to excel at performing matrix calculations on arrays.
  - Programs that use intensive large matrix calculations will benefit from fitting the entire matrix in the L2 cache.
- Processor core clock-for-clock improvements, including larger TLB (Translation Look-Aside Buffers) with reduced latencies and improved branch prediction through four times the number of bimodal counters in the global history counter, as compared to seventh-generation processors.
  - These features drive improvements to the IPC, by delivering a more efficient pipeline for CPU-intensive applications.
  - CPU-intensive games like Comanche 4 and Unreal Tournament benefit from these core improvements.
- Introduction of the SSE2 instruction set, which along with support of 3DNow!™ Professional, (SSE and 3DNow! Enhanced) completes support for all industry-standard x86 32-bit instruction set extensions.
- 64-bit processing
  - A 64-bit address and data set enables the processor to process in the terabyte space.
  - Microsoft® Windows® XP 64-Bit Edition for 64-Bit Extended Systems supports up to 32 GB of RAM and up to 16 TB of virtual memory.
  - Gamers can preload entire three-dimensional worlds into memory for a fully immersive experience.
  - Amateurs can edit home videos with ease, providing professional results.
  - The 64-bit space is designed to bring home the digital experience.

Figure 1 is a generic diagram showing the architecture internal to all AMD64 technology-based processors.

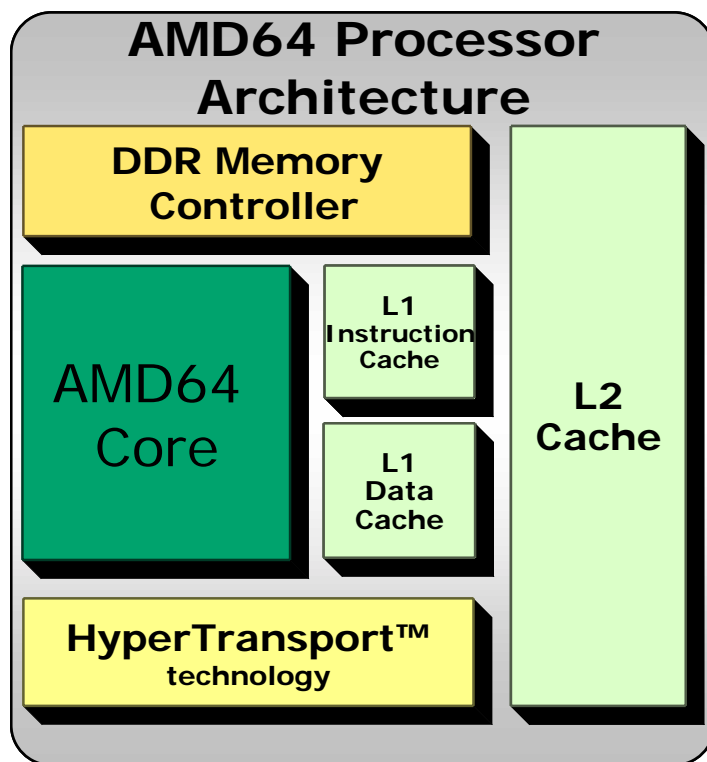
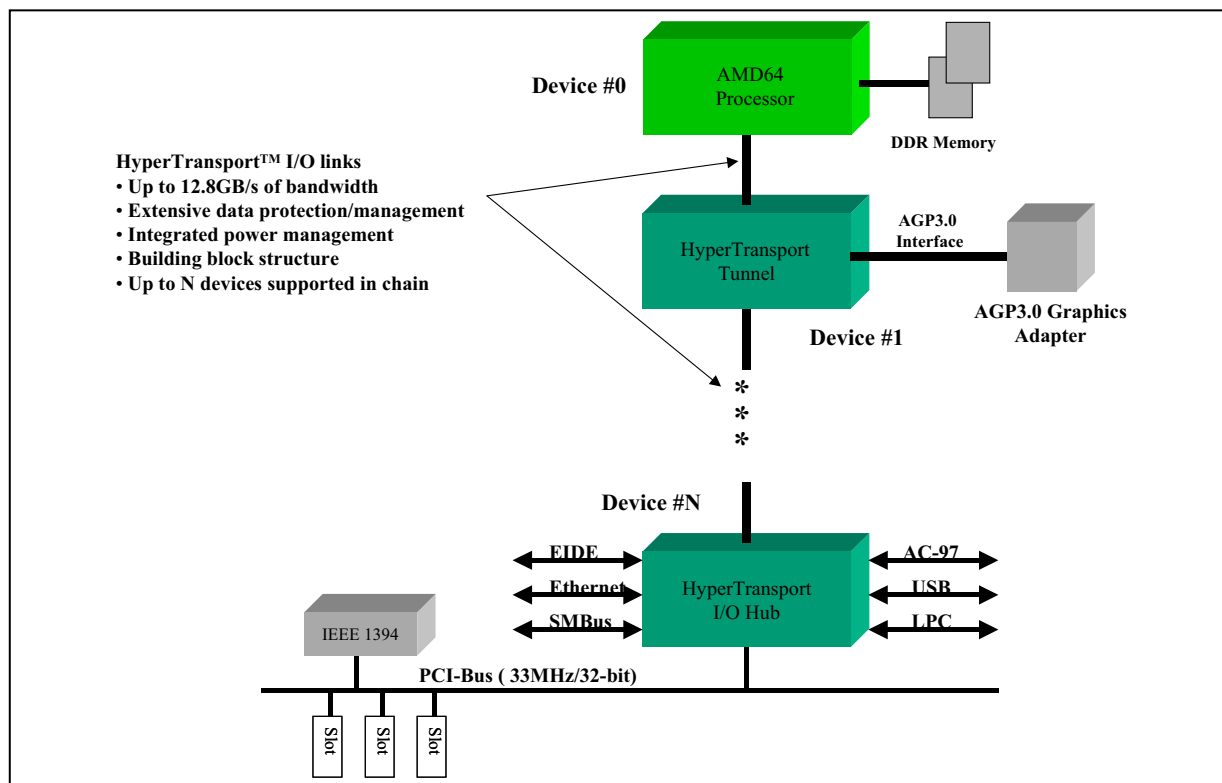


Figure 1. AMD64 Processor Architecture



Figure 2 is a block diagram of a system using HyperTransport technology.



**Figure 2. HyperTransport™ Technology Block Diagram**



# AMD's Benchmarking Methodology

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AMD assembled a suite of industry standard benchmarks and applications that we believe reflects typical end user applications. Specifically, AMD has identified three usage models which we believe best exemplify the commercial and consumer end-user PC experience:

1. Office Productivity
2. Digital Media
3. Gaming

From this list, AMD chose the following benchmarks and applications to represent these end-user experiences. AMD recommends the use of the following benchmarks below for proper, balanced, real-world performance analysis.

## Office Productivity

AMD Athlon™ 64 and AMD Athlon 64 FX processors with HyperTransport™ technology run multiple tasks very efficiently. Work productivity may increase because you can perform more tasks and wait less for an application to deliver a response. The following applications simulate a workload likely to be seen in an office workplace environment.

- Business Winstone® 2004 v1.0
  - Microsoft® Internet Explorer 6
  - Microsoft Outlook 2002 SP-2
  - Microsoft Project 2002
  - Microsoft Access 2002 SP-2
  - Microsoft PowerPoint 2002 SP-2
  - Microsoft Excel 2002 SP-2
  - Microsoft FrontPage 2002 SP-2
  - Microsoft Word 2002 SP-2
  - Norton AntiVirus Professional Edition 2003
  - WinZip 8.1 SR-1
- Business Winstone 2004 Multitasking v1.0
  - Multitasks applications found in Business Winstone 2004 v1.0
- SYSmark® 2004, Office Productivity
  - Adobe® Acrobat® 5.0.5
  - Microsoft Access 2002
  - Microsoft Excel 2002
  - Microsoft Internet Explorer 6
  - Microsoft Outlook 2002
  - Microsoft Word 2002
  - Network Associates McAfee VirusScan 7.0
  - ScanSoft Dragon Naturally Speaking 6 Preferred
  - WinZip Computing WinZip 8.1
- WinRAR

## Digital Media

AMD64 processor-based systems take advantage of the newly-designed system features and deliver outstanding performance for digital creation and playback.

- Content Creation Winstone<sup>®</sup> 2004
  - Adobe<sup>®</sup> Photoshop<sup>®</sup> 7.01, Adobe Premiere 6.50
  - Macromedia Director MX 9.0, Macromedia Dreamweaver MX 6.1
  - Microsoft<sup>®</sup> Windows Media Encoder 9 version 9.00.00.2980
  - Newtek LightWave 3d 7.5b
  - Steinberg Wave Lab 4.0
- Mpeg2 conversion
  - BBmpeg to convert 640 MB raw AVI (AustinMontageLong.avi) to Mpeg2
- RazorLAME ver. 1.1.5
- SYSmark<sup>®</sup> 2004 Internet Content Creation
  - Adobe Photoshop 7.01, Adobe Premiere 6.5, Adobe After Effects 5.5
  - Discrete 3ds max 5.1
  - Network Associates McAfee VirusScan 7.0
  - WinZip Computing WinZip 8.1
  - Macromedia Dreamweaver MX, Macromedia Flash MX
- Mpeg2 to Mpeg4
  - X MPEG 5.02 and DivX 5.03 used to convert from Mpeg2 to Mpeg4

## 3D Gaming

The high performance benefits will amaze 3D gamers. The following benchmarks focus on the three dimensional capabilities of a system.

**Note:** *3D gaming may reveal limitations in a graphics card and may not truly represent relative processor performance.*

- 3DMark<sup>®</sup> 2001SE (Hardware and Software)
- 3DMark 2003 (Hardware and Software)
- AquaMark3
- Comanche 4
- Half-Life Smokin'
- Quake III
- Return to Castle Wolfenstein 3D
- Serious Sam: Second Encounter
- Splinter Cell (tests 1\_1\_1 and 1\_1\_2)
- Star Wars – Jedi Knight II: Jedi Outcast
- Unreal Tournament 2003 (Flyby and Botmatch)

## Optimal System Configuration

This section describes the configurations that AMD used to perform the benchmarks. Systems that conform to the configurations shown in Table 1, Table 3 on page 22, and Table 4 on page 23, are the most likely to obtain optimal system performance.

**Table 1. AMD Athlon™ 64 Processor 3700+ System Configuration**

Component	Manufacturer	Model	Description
<b>Processor</b>	AMD	AMD Athlon™ 64 Processor 3700+	Clock frequency: 2.4 GHz
<b>Operating System</b>	Microsoft®	Windows® XP Professional	Version 2002 (Service Pack 1a)
<b>Motherboard</b>	MSI	A6702VMS V1.0 10/24/03	Via K8T800, onboard SATA drive SATA driver Promise technologies 1.0.1.28
<b>Hard drive</b>	Western Digital	Raptor	(2x) SATA RAID 10k RPM 36.0 GB
<b>RAM memory</b>	Corsair	CMX512-3500LL	2 X 512 MB DIMM PC3500 Module
<b>Video Card</b>	NVIDIA	FX5950 256 MB	256 MB Onboard DDR RAM, Video Driver 5.3.0.3

**Table 2. AMD Athlon™ 64 Processor 3800+ System Configuration**

Component	Manufacturer	Model	Description
<b>Processor</b>	AMD	AMD Athlon™ 64 Processor 3800+	Clock frequency: 2.4 GHz
<b>Operating System</b>	Microsoft®	Windows® XP Professional	Version 2002 (Service Pack 1a)
<b>Motherboard</b>	Asus	Asus A8V BIOS 1002 <sup>1</sup>	Via K8T800, Onboard SATA drive SATA driver VIA 5.1.2600.300
<b>Hard drive</b>	Western Digital	Raptor	(2x) SATA RAID 10k RPM 36.0 GB
<b>RAM memory</b>	Corsair	CMX512-3500LL	2 X 512 MB DIMM PC3500 Module
<b>Video Card</b>	NVIDIA	FX5950 256 MB	256 MB Onboard DDR RAM, Video Driver 5.3.0.3

**Note:**

1. This BIOS version was not publicly available at the time of print

**Table 3. AMD Athlon™ 64 FX-53 Processor System Configuration**

Component	Manufacturer	Model	Description
Processor	AMD	AMD Athlon™ 64 FX-53 Processor	Clock frequency: 2.4 GHz
Operating System	Microsoft®	Windows® XP Professional	Version 2002 (Service Pack 1a)
		Windows XP Professional 64-Bit Edition	Build 1069 <sup>2</sup>
Motherboard	ASUS	MSI- MS7025 BIOS 1.0b11 <sup>1</sup>	NVIDIA NForce3 Chipset, SATA Driver: Promise technologies 1.0.1.37
			SATA Driver: Promise Technologies 1.00.1450.372 <sup>2</sup>
Hard drive	Western Digital	Raptor	(2x) SATA RAID 10k RPM 36.0 GB
RAM memory	Corsair	CMX512-3500LL	2 x 512 MB Registered DIMM Modules
Video Card	NVIDIA	FX5950 256 MB	256 MB Onboard DDR RAM Video Driver 5.3.0.3
			Video Driver 5.2.1.4 <sup>2</sup>
Note:			
1. This BIOS version was not publicly available at the time of print			
2. This version is for use in the upcoming Windows® 64-Bit operating environment.			

**Table 4. Intel Pentium® 4 Processor 3.4 GHz and Extreme Edition  
3.4 GHz System Configurations**

Component	Manufacturer	Model	Description
<b>Processor</b>	Intel	Intel Pentium® 4 processor with HT technology Extreme Edition	Clock Frequency: 3.4 GHz, 800 MHz System Bus
		Intel Pentium® 4 processor with HT technology	Clock Frequency: 3.4 GHz, 800 MHz System Bus
<b>Operating System</b>	Microsoft®	Windows® XP Professional	Version 2002 (Service Pack 1a)
<b>Motherboard</b>	Intel	D875PBZ, BIOS BZ87510A.86A.0068.P14.0 3009162312	Intel i875 Chipset, Intel 82801ER SATA Raid Controller 3.5.0.2568
<b>Hard drive</b>	Western Digital	Raptor	2 X SATA RAID 10 k RPM 36.0 GB
<b>RAM memory</b>	Corsair	CMX512-3500LL	2 X 512 MB XMS3500 DIMM Module
<b>Video Card</b>	NVIDIA	FX5950 256 MB	256 MB Onboard DDR RAM, Video Driver 5.3.0.3

The following sections detail how to set up the BIOS, the operating system, and show you which settings AMD uses for running each benchmark.





## BIOS Configuration for the AMD Athlon™ 64 Processor 3700+

The setup instructions below apply to the AMD Athlon 64 processor models 3700+. Modifications should be made to any other configuration where applicable.

Use the following steps to set up the BIOS for optimal operation with the AMD Athlon 64 processor 3700+. To navigate through the BIOS screens, use the arrow keys (Right Arrow →, Left Arrow ←, Up Arrow ↑, and Down Arrow ↓) to select menus and to highlight specific options to change. For most options, use the + and – keys to change the setting.

1. Press Del to enter the BIOS setup screens.
2. Reset the system options.
  - a. Press the Right Arrow, select the **EXIT** menu, and then press Enter.
  - b. Press the Down Arrow to **Load Setup Default** and then press Enter.
3. A dialog box opens that says **Load Optimized Defaults (Y/N): Y**. Ensure that **Y** is highlighted, and then press Enter.
4. Set the **Main** options.
  - a. Press the Right Arrow, select the **Main** menu, and then press Enter.
  - b. Use the + and – keys to set the system date to August 19, 2003 Tuesday.
5. Set the **Advanced** board options.
  - a. Press the Right Arrow, select the **Advanced** menu, and then press Enter.
  - b. Press the Down Arrow to **Chipset** and then press Enter.
  - c. Press the Down Arrow to **Northbridge** and then press Enter.
  - d. Press the Down Arrow to **Memory Configuration** and then press Enter.
  - e. Press the Down Arrow to **Memclock Mode** and then set the mode to **Manual**.
  - f. Press the Down Arrow to **CAS Latency** and then set the value to 2.0.
  - g. Press Esc to go to the **Northbridge** menu.
  - h. Press Esc to exit to the **Chipset** menu.
6. Press the Down Arrow to the **Southbridge** menu and then press Enter.
  - a. Press the Down Arrow to **AGP** and then press Enter.
  - b. Press the Down Arrow to **AGP Aperture Size** and then select **256 MB**.
  - c. Press Esc to exit to the **Southbridge** menu.
  - d. Press Esc to exit to the **Chipset** menu.
  - e. Press Esc to exit to the **Advanced** menu.
7. Press the Down Arrow to **Integrated Peripherals** and then press Enter.
  - a. Press the Down Arrow to **Serial Port 1** and then select **Disabled**.

- b. Press the Down Arrow to **Serial Port 2** and then select **Disabled**.
- c. Press the Down Arrow to **VT8327 SATA – IDE Controller** and then select **Disabled**.
- d. Press the Down Arrow to **Onboard LAN Controller** and then select **Enabled**.
- e. Press the Down Arrow to **Onboard Promise SATA** and then press Enter.
- f. Press the Down Arrow to **Onboard Promise SATA** and then select **SATA**.
- g. Press Esc to exit to the **Onboard Promise** menu.
- h. Press Esc to exit to the **Advanced** menu.
8. Press F10 to save and exit the setup.
9. Press Enter to continue booting the system.

## BIOS Configuration for the AMD Athlon™ 64 Processor 3800+

The setup instructions below apply to the AMD Athlon 64 processor model 3800+. Modifications should be made to any other configuration where applicable.

Use the following steps to set up the BIOS for optimal operation with the AMD Athlon 64 processor 3800+. To navigate through the BIOS screens, use the arrow keys (Right Arrow →, Left Arrow ←, Up Arrow ↑, and Down Arrow ↓) to select menus and to highlight specific options to change.

1. Press Del to enter the BIOS setup screens.
2. Reset the system options.
  - a. Select the **EXIT** menu, and then press Enter.
  - b. Select **Load Setup Default** and then press Enter.
3. A dialog box opens that says **Load Optimized Defaults OK**. Ensure that **OK** is highlighted, and then press Enter.
4. Set the **Advanced** board options.
  - a. Select the **Advanced** menu, and then press Enter.
  - b. Select **Chipset** and then press Enter.
  - c. Select **CPU Configuration** and then press Enter.
  - d. Select **Memory Configuration** and then press Enter.
  - e. Press the Down Arrow to **Memclock Mode** and then set the mode to **Manual**.
  - f. Select **CAS Latency** and then set the value to 2.0.
  - g. Select **TRCD** and then set the value to 3 CLK.
  - h. Select **TRAS** and then set the value to 5 CLK.
  - i. Select **TRP** and then set the value to 3 CLK.
  - j. Select **AYSNCLAT** and then set the value to 6 CLK.

- k. Press Esc to go to the **Advanced** level.
  - l. Select the **Advanced** menu, and then press Enter.
  - m. Select **Chipset** and then press Enter.
  - n. Select **AGP Bridge Configuration** and then press Enter.
  - o. Select **AGP Graphics Aperture Size** and then select **256 MB**.
  - p. Press Esc to exit to the **Chipset** menu.
  - q. Select **USB Configuration** and then press Enter.
  - r. Select **USB 1.1 ports Configuration** and then select **Disable**.
  - s. Press Esc to go to the **Advanced** menu level.
  - t. Select **Onboard devices** and then press Enter.
  - u. Select **Onboard Promise Controller** and then select **Disabled**.
  - v. Select **Onboard IEEE 1394** and then select **Disabled**.
  - w. Select **Onboard Serial Port 1 Address** and then select **Disabled**.
  - x. Select **Onboard Serial Port 2 Address** and then select **Disabled**.
  - y. Press Esc to exit to the **Advanced** menu.
  - z. Select **System Freq/Volt Configuration** and press Enter
  - aa. Select **AI Overclocking** and select **Standard**
  - ab. Select **Speech Configuration** and press enter
  - ac. Select **Speech Post Reporter** and select **Disabled**.
  - ad. Press escape to return to the main level.
- 5. Select **Power** and press Enter.
    - a. Select **Hardware Monitor** and press Enter.
    - b. Select **CPU Fan Speed** and select **Ignored**
  - 6. Press F10 to save and exit the setup.
  - 7. Press Enter to continue booting the system.

## BIOS Configuration for the AMD Athlon™ 64 FX-53 Processor

The setup instructions below apply to the AMD Athlon™ 64 FX-53 processor. Modifications should be made to any other configuration where applicable.

Use the following steps to set up the BIOS for optimal operation with the AMD Athlon™ 64 FX-53 processor. To navigate through the BIOS screens, use the arrow keys (Right Arrow →, Left Arrow ←, Up Arrow ↑, and Down Arrow ↓) to select menus and to highlight specific options to change.

1. Press Del to enter the BIOS setup screens.
2. Reset the system options.
  - a. Select the **Load High Performance Options** and then press Enter.
3. Set the **Advanced Chipset Features**.
  - a. Select the **Advanced Chipset Features** menu and then press Enter.
  - b. Select **CAS Latency** and then set the value to 2.0.
  - c. Select **TRCD** and then set the value to 3 CLK.
  - d. Select **TRP** and then set the value to 3 CLK.
  - e. Select **AGP Aperture** and select 256 MB.
4. Press the Esc to the **Main** menu.
- a. Select the **Integrated Peripherals** menu and press enter.
  - b. Select **OnBoard PCI Controller** and press enter.
  - c. Select **P20579 SATA Controller** and select RAID.
  - d. Select **AC'97 Audio** and select Enabled.
  - e. Press Esc to exit to the **Main** menu.
5. Select Advanced BIOS Feature and press Enter.
  - a. Select **Boot Sequence** and press Enter.
  - b. Select **Try Other Boot Devices** and select **NO**.
6. Press F10 to save and exit the setup.
7. Press Enter to continue booting the system.

## Operating System Configuration

The following setup instructions apply to all processors. The operating system should be installed on the platform using an NTFS partition. The default settings should be used during the installation. The system setup instructions below can be followed to fully achieve optimal system performance.

### Operating System Setup

1. During boot up, press Enter to boot the system from the CD-ROM.
2. Press F6 to install the drivers for serial ATA.
3. Press S to specify an additional device.

4. Insert the floppy disk with the downloaded ATA drivers.

***Note:** Leave the disk in the drive until the procedure asks you to reboot. The disk is needed during the initial setup sequence.*

5. Press Enter to continue.
6. For MSI motherboards, select **WinXP Promise SATA378 Controller**.
7. For ASUS motherboards, select **WinXP Promise FastTrak 376/378 Controller**.
8. Press Enter to continue.
9. Press Enter to continue the installation of **Windows® XP Evaluation Software**.
10. Press Enter to continue setup of Windows XP.
11. Press F8 to agree to the license agreement.

***Note:** If the drive is not yet formatted, or formatted with another operating system, steps 12 and 13 do not apply. Instead, skip to step 14.*

12. Select **ESC=Don't Repair** to install a fresh copy of Windows XP without repairing.
13. Select **D=Delete Partition** to delete all existing partitions.

***Note:** If there are no existing partitions, this step will not appear.*

14. Select C to create a partition.
  - a. Type a partition size of **57232** for the first partition and then press Enter.
  - b. Press the Down Arrow to the unpartitioned space and then press **C** to create this partition.

- c. Press Enter to accept the default value. There will be 8 Mbytes of unpartitioned space.
15. Select **Format the partition using the NTFS (Quick) file system** and then press Enter.
16. Click **Yes** to verify installations of serial ATA drivers.
17. Click **Next** to continue on Regional and Language Options.
18. Type in your name and organization.
19. Type in a valid Windows XP product key and then click **Next**.
20. Type the administrator password twice and then click **Next**. AMD recommends to leave the password blank.
21. Click **Next** on **Date and Time Settings**.
22. Click **Next** on **Networking Settings** to confirm **Typical Settings**.
23. Click **Next** on **Workgroup and Computer Domain**.
24. Click **Ok** to confirm display settings.
25. Click **Ok** to confirm new monitor settings.
26. Click **Next** to continue on **Welcome to Microsoft® Windows®**.
27. Click **Skip** to bypass **Networking Settings**.
28. Select **No** to bypass **Activate Windows** and then click **Next**.
29. Type in your user name and then click **Next**.
30. Click **Finish**.
31. Open **My Computer**.
32. Right click on drive **D:**.
33. Click **Format**.
34. Select Quick format.

35. Click **Start**.
36. Click **Ok** to confirm format.
37. On desktop, right click My Computer.
38. Select **Properties** and click the **Advanced** tab.
39. Click **Performance Options**.
40. Click **Settings** and click **Advanced**.
41. Click **Change for Virtual Memory**.
42. Select drive **C** and select **No paging file** under **Change virtual memory (paging file)**.
43. Click **Set**.
44. Select drive **D** select **Custom size**.
45. Type **1536** MB for Initial Size.
46. Type **3072** MB for Maximum Size.
47. Click **Set**.
48. Click **Ok** and restart computer.
49. On desktop right click **My Computer**.
50. Select **Properties** and click **Automatic Updates**.
51. Select **Turn off Automatic Updating. I want to update my computer manually**.
52. Click **Apply**.
53. Click **System Restore** and select **Turn off System Restore on all drives**.
54. Click **Apply**.
55. Click **Yes** to verify Turn Off System Restore.
56. On the desktop right click **My Computer**.
57. Select **Properties** and click the **Advanced** tab.
58. Click **Settings** under **Performance**.
59. Select **Adjust for best performance**.
60. Click **Apply**.

61. Right click the task bar and select **Properties**.
62. Deselect **Keep the taskbar on top of other Windows**.
63. Click **Apply**.
64. Open **Control Panel** and double click **Power Options**.
65. Select **Always On** from **Power Schemes** and select **Never to Turn off monitor**.
66. Click **Apply**.
67. Right click on the desktop and select **Properties**.
68. Click **Screen Saver** and select **None**.
69. Click **Apply**.

### Install XP Service Pack 1A

From the disk, install Microsoft® Windows® XP Service Pack 1A Network Installation:

1. Install Microsoft® Windows® XP Service Pack 1a Network Installation **xpsp1a\_en\_x86.exe** self-extracting cabinet (version 1.16.121.0).
2. Click **Next** to continue.
3. Select **I agree** and click **Next**.
4. Select **Do not archive files** and click **Next**.
5. Click **Finish** to restart computer.

### Install MSI Motherboard Drivers

*Note: These instructions are applicable to MSI motherboards ONLY.*

1. Install **VIAHyperion4in1448V.exe** chipset drivers.
2. Double click the **.exe** file.
3. Click **Next** to start install.
4. Click **Yes** to agree to license.

5. Select **Normal installation** and Click **Next**.
6. Click **Next** to install default components.
7. Select **Install VIA PCI IDE Bus Driver** and click **Next**.
8. Select **Install AGP driver** and click **Next**.
9. Select **Yes, I want to restart the computer** and click **Ok**.

### Install ASUS Motherboard Drivers

*Note: ASUS motherboard drivers are not publicly available. These instructions are applicable to ASUS motherboards ONLY.*

1. Extract the version 353 driver files from the AMD install CD or download the latest drivers from <http://www.asus.com/>
2. Double click **Setup.exe**.
3. Click **Next** to continue.
4. If the VGA driver install wizard appears, click **Cancel** to install the VGA drivers after the motherboard drivers are installed.
5. Click **Next** after reviewing the latest information for the IDE drivers.
6. Click **Yes** to install the NVIDIA IDE SW driver.
7. If the drivers are not WHQL approved, each driver will ask if you wish to continue installing the software. Click **Continue Anyway** for each driver in this sequence.
8. Click **Next** to install the NVIDIA nForce™ Audio Device.
9. Click **Finish** to close the audio device wizard.
10. Click **Finish** to restart the computer.

### DirectX 9.0B

1. Install **DirectX 9B\_redist.exe** from CD.
2. Click **Yes** to accept **License Agreement**.
3. Click **Unzip** to specified location (for example c:\dx9) and click **Unzip**.
4. Install DirectX from **c:\dx9\dxsetup.exe**.
5. Click **Next** to accept **License Agreement**.
6. Click **Next** to install *DirectX 9.0*.
7. Click **Finish** to restart computer.

*Note: DX9.0B must be installed before performing the video card setup*

### NVIDIA Video Card Setup

*Note: The tested driver for the NVIDIA card is not publicly available. These steps assume you wish to install a publicly-available driver.*

1. Download the video card driver from <http://www.nvidia.com/content/drivers/drivers.asp>
2. Double click the **.exe** file.
3. Click **Yes** to continue when asked if antivirus software has been installed.
4. Select the button next to **I accept the terms in the license agreement**.
5. Click **Next** to accept the license agreement terms.
6. Allow the install to place files in the default location, like **C:\NVIDIA\WinXP-2K\53.03**

*Note: The install directory may be different if you have a different version of the driver files.*

7. Click **Next** to install the shield wizard.
8. Click **Next** to continue the setup.

9. Click **Yes** to accept the license.
10. Click **Yes** to restart the computer.
11. Right click on the desktop and select **Properties** sub-menu item.
12. Choose **Settings** tab.
13. Change color depth to **32-bit**.
14. Change **Screen Resolution** to **1024 by 768 pixels**.
15. Click **Apply** to implement settings.
16. Click **Yes** to save settings.
17. Choose **Monitor** tab and choose **85 Hz** for **Set Screen Refresh**.
18. Choose **GeForce FX 5950** tab. Select **OpenGL Settings** under **Performance and Quality Settings**.
19. Next to **Vertical Sync**, press the down arrow, and select **Always Off**.
2. Click **Yes** to run *DirectX Diagnostic Tool*.
3. Select the **More Help** tab.
4. Click **Override** and select **Override Value**.
5. Type **85**.
6. Click **Ok**.
7. Click **Exit** and restart computer.
8. Deselect **Show this screen next time you start Windows** when **Desktop Help for ATI** window appears.

*Note: Do not change other OpenGL settings.*

### Direct X Setup Using DXDIAG

1. Run **DXDIAG** from the command line.

### WCPUID v3.1 Setup

1. Download **wcpuid v3.1** from <http://www.h-oda.com>
2. Install **wcpuid31** to c:\wcpuid.
3. Run **c:\wcpuid\wcpuid.exe**.
4. Ensure that **AGP Data Rate** is set to **8x** under the chipset tab.

Your operating system should now be configured properly.



## Benchmark Configuration and Testing

With a properly configured system, benchmarking can begin. Each installation program is located on your install disk, and is subject to the licensing terms contained therein. The following procedures are recommended to achieve optimal and accurate benchmark scores:

### AquaMark3 (1024x768x32)

1. Install AquaMark3: **AquaMark3.exe**.
2. Click **Next** on the **Welcome Screen**.
3. Select Yes and click **Next** on the **EULA Screen**.
4. Click **Next** for **Read Me Screen**.
5. Click **Next** to install to default **Destination Location**.
6. Click **Next** to install to default **Program Manager Group**.
7. Click **Next** to **Start Installation**.
8. Click **Finish** to complete installation.

#### *To run the benchmark:*

1. Choose **Programs** and **AquaMark3** from the Windows **Start** Menu to execute **AquaMark3**.
2. Select **Options**
3. Set resolution to 1024x768.
4. Select **Back**
5. Select OK at the **Your settings changes requires new video restart** prompt.
6. Select OK at the **New Video settings are being used** prompt.
7. Choose **Select Measurement**
8. Select Start Measurement at **Aquamark3 Score measurement**.

### BAPCO® SYSmark® 2004 Internet Content Creation and Office Productivity

*Note: Results for both Internet Content Creation and Office Productivity are generated during each run of the benchmark.*

1. Install the **BAPCO® SYSmark® 2004** DVD.
2. Run setup to install SYSmark 2001 **c:\sm2004src\setup.exe**.
3. At the **Welcome** screen click Next.
4. At the **Licence** screen read the license agreement, select I accept, then click Next.
5. At the **Customer Information** screen click Next.
6. At the **Destination directory** screen click Next.
7. At the **Select Program Folder** screen click Next.
8. At the **Question** screen click Yes.
9. At the **Install Complete** screen click Finish.

#### *To run the benchmark:*

1. Execute SYSmark 2001 from Windows **Start** menu.
2. Click **Run**.
3. Click **Official Run**.
4. Type project name and click **Ok**.

**bbmpeg (raw AVI to MPEG2)**

1. Open folder **bbmpg12418**.
2. Extract **bbmpg12418.exe** to c:\bbmpg folder on the desktop.
3. Copy **AustinMontageLong.avi** to desktop.
4. Execute **avimp2** from c:\bbmpg.
5. When the dialog box opens do the following:
  - a. Click **ADD** and choose **AustinMontageLong** from desktop.
  - b. Click **MPEG filename**.
  - c. Type filename **testfile**.
  - d. Click **Save** to continue.
  - e. Uncheck **Preview with frame operations**.
  - f. Click **Start Encoding** and then **Settings**.
  - g. Under **General Settings** tab, change **MMX modes** to **\*SSE-fastest (Pentium® III and AMD Athlon™ 64 Processors)**.
  - h. Under **Video Stream Settings**, click **MPEG-2** and click **Ok**.

*To run the benchmark:*

1. Click **Start** immediately after the above step.

**Comanche 4 Demo (1024x768x32)**

1. Install Comanche 4: **C4DEMOX.exe**.
2. Click **Next** to install Comanche 4.
3. Click **Yes** to accept **License Agreement**.
4. Click **Next** to install to default **Destination Location**.
5. Click **Finish** to complete installation.

*To run the benchmark:*

1. Execute Comanche 4 Demo Benchmark Test.
2. Select **Disable Audio**.
3. Select **1024x768** for Screen Resolution
4. Creates an output file. Rename it to **Comanche Run 1**.

*Note: For the first time run, the system performs a system check.*

5. Click **Run Benchmark**.
6. Click **Ok** to select Video Card.
7. Click **Ok** for Resolution Test.
8. Click **Ok** for Resolution Test Complete.

**Ziff Davis Media Inc.'s Business Winstone® 2004 v1.0**

1. Click on install in the directory where Business Winstone is located.
2. Click Business Winstone 2004.
3. On the Welcome screen, click **next**.
4. On the Choose Destination location screen, click **next**.
5. On the Confirm new directory screen, click **next**.
6. On the Select New Components screen, select **copy multimedia content support files** then click **next**.
7. On the Program Folders screen, click **next**.
8. On the Start Copying files screen click next.
9. On the **Setup complete** screen, click **Finish**.
10. Close the readme file.

**To run the benchmark:**

1. Execute *Ziff Davis Media Inc.'s Content Creation Winstone 2004* from **Start** menu.
2. Read the licence and select proceed. Than click **Next**.
3. At the **registration** screen click **yes**.
4. At the functions dialog screen click on the clock icon next to **1. Run** item.
5. Click **Next** to run System Configuration Problem Analysis.
6. Click **Next** for Minimum Resource Requirements.
7. Click **Next** for Other Requirements.
8. Click **Next** for Other Requirements.
9. Click **Next** for Other Requirements.
10. Click **Next** for *Content Creation Winstone* Requirements.
11. Click **Finish** for System Configuration Problem.
12. Click Ok for Automated Defrag.

**Ziff Davis Media, Inc.'s Business Multitasking Winstone® 2004 v1.0**

1. If benchmark is not installed from Veritest Business Winstone 2004 testing proceed with the steps below. If it is installed, proceed to the to run the benchmark section.
2. Click on install in the directory where Veritest Winstone is located.
3. Click **Business Multitasking Winstone 2004**.
4. On the Welcome screen click **next**.
5. On the Choose Destination location screen and click **next**.

6. On the Confirm new directory screen, click **next**.
7. On the Select New Components screen, select copy multimedia content support files then click **next**.
8. On the Program Folders screen, click **next**.
9. On the Start Copying files screen, click **next**.
10. On the **Setup complete** screen, click **Finish**.
11. Close the readme file.

**To run the benchmark:**

1. Execute *Ziff Davis Media Inc.'s Content Creation Winstone 2004* from **Start** menu.
2. Read the licence and select proceed. Than click Next
3. At the **registration** screen, click **yes**.
4. At the Function Dialog screen. Click in the pull down menu next to the **1. Run** item and select **Multitasking test**.
5. At the functions dialog screen click on the clock icon next to **1. Run** item.
6. Click **Next** to run System Configuration Problem Analysis.
7. Click **Next** for Minimum Resource Requirements.
8. Click **Next** for Other Requirements.
9. Click **Next** for Other Requirements.
10. Click **Next** for Other Requirements.
11. Click **Next** for *Content Creation Winstone* Requirements.
12. Click **Finish** for System Configuration Problem.
13. Click Ok for Automated Defrag.

**Ziff Davis Media Inc.'s Content Creation Winstone® 2004**

1. Click on install in the directory where Winstone is located.
2. Click **Content Creation Winstone 2004**.
3. On the **Welcome** screen, click **next**.
4. On the **Choose Destination location** screen, click **next**.
5. On the **Confirm new directory** screen, click **next**.
6. On the **Select New Components** select copy multimedia content support files then **Click next**
7. On the **Program Folders** screen, click **next**.
8. On the **Start Copying files** screen, click **next**.
9. On the **Welcome to media encoder 9 series setup** screen, click **next**.
10. On the EULA screen, read the license then select **I accept the terms of this agreement**, then click **next**.
11. On the **Installation folder** screen, click **next**.
12. On the **Ready to install** screen, click **next**.
13. On the **Completing the windows media encoder 9 series setup wizard** screen, click **Finish**.
14. On the **Windows media encoder 9 installation completed successfully** screen, click **OK**.
15. On the **Setup complete** screen click **Finish**.
16. Close the readme file.

**To run the benchmark:**

1. Execute *Ziff Davis Media Inc.'s Content Creation Winstone 2004* from **Start** menu.
2. Read the licence and select proceed. Than click **Next**.
3. At the **registration** screen click **yes**.
4. At the functions dialog screen click on the clock icon next to **1. Run** item.
5. Click **Next** to run System Configuration Problem Analysis.
6. Click **Next** for Minimum Resource Requirements.
7. Click **Next** for Other Requirements.
8. Click **Next** for Other Requirements.
9. Click **Next** for Other Requirements.
10. Click **Next** for *Content Creation Winstone* Requirements.
11. Click **Finish** for System Configuration Problem.
12. Click **Ok** for Automated Defrag.

**Futuremark Corporation 3DMark® 2001 – Second Edition**

1. Click **Next** to install *3Dmark2001® SE Pro*.
2. Enter the Registration code and click **Next**.
3. Click **Ok** registration code confirmation.
4. Click **Yes** to accept License Agreement.
5. Click **Next** to install to default Destination Location.
6. Click **Next** to start Coping Files.
7. Click **Finish** to complete installation.
8. Install patch:  
**3Dmark2001SE\_patch.exe** (Version 2.11.15.0).

9. Click **Next** to install *3Dmark2001 SE* patch.
10. Click **Ok** to confirm installation.

*To run the software benchmark:*

1. Execute **3Dmark2001 SE Pro**.
2. Click **Change** in Display and CPU Settings.
3. Select **D3D Software T&L** under Rendering Pipeline.
4. Click **Ok**.
5. Click **Change** under Selected Test.
6. Select only the first four game tests under Game Performance.
7. Deselect the remaining test.
8. Click **Ok**.
9. Click **Benchmark** to launch test.

*Note: After each run, exit and restart the program.*

*To run the hardware benchmark:*

1. Execute *3Dmark2001 SE Pro*.
2. Click **Change** in Display and CPU Settings.
3. Ensure that **Double buffering** is set to **Enabled**.
4. Select **D3D Hardware T&L** under Rendering Pipeline.
5. Click **Ok**.
6. Click **Change** under Selected Test.
7. Select only the first four game tests under Game Performance.
8. Deselect the remaining test.
9. Click **Ok**.
10. Click **Benchmark** to launch test.

*Note: After each run, exit and restart the program.*

## Futuremark Corporation 3DMark® 2003

1. Execute *3DMark® 2003: mg-3dmark03.exe* (version 7.1.100.1248).
2. Click **Next** to install *3Dmark03*.
3. Select **I accept the terms of the license agreement** and click **Next**.
4. Click **Next** to install to default Destination Location.
5. Click **Install** to Install the Program.
6. Enter the registration code and click **Next**.
7. Click **Ok** registration code confirmation.
8. Click **Finish** to complete installation.
9. Install patch **3Dmark03\_patch340.exe** (version 7.1.100.1248).
10. Click **OK** for information box about DX9 install.
11. Click **Next** to install *3Dmark2001 SE* patch.
12. Click **Finish** to confirm installation.

*To run the software benchmark:*

1. Execute **3DMark03**.
2. Select **Do not show this dialog again** and click **Close**.
3. Click **Select** under Tests.
4. Select first four games under **Game Test** and deselect the other test.
5. Click **Ok**.
6. Click **Change** under **Settings**.
7. Click **Force Software Vertex Shaders** box.
8. Click **Ok**.
9. Click **Run 3Dmark**.

*To run the hardware benchmark:*

1. Execute **3DMark03**.
2. Click **Select** under Tests.
3. Select first four games under **Game Test**.
4. Deselect the remaining test.
5. Click **Ok**.
6. Click **Run 3Dmark**.

**Half-Life Smokin' (1024x768x32)**

1. Click **Install Half-Life** and click **Yes** if you heard a sound (click **Yes** even if there are no speakers).
2. Click **Next** to install *Half-Life*.
3. Click **Yes** to accept License Agreement.
4. Click **Next** to install to default Destination Location.
5. Click **Ok** to begin setup.
6. Click **Ok** to complete setup.
7. Click **No** to not check for available updates.
8. Click **Ok** to register now and click Register Later.
9. Click **Next** to select components.
10. Click **Finish** to complete setup.
11. Go to Windows **Start** menu and select **Half-Life**.
12. Click **Don't show me again**.
13. Click **Continue** to acknowledge compatibility issue.
14. Type in registration code and click **Finish**.
15. Execute **Half-Life Console**.
16. Click **Configuration**, **Video**, and **Video Modes**.

17. Select **Open GL** and click **Ok**.
18. Click **Cancel** for New Connection Wizard.
19. Select **1024x768** and click **Ok**.
20. Click **Done** to exit video menu.
21. Click **Done** to exit menu.
22. Click **Quit** to exit game.
23. Click **Ok** to confirm exit.
24. Install *Half-Life* patch:  
**10051009.exe**.
  - a. Click **Next** to install *Half-Life* Update 1.0.0.9.
  - b. Click **I Agree to accept License Agreement**.
  - c. Click **Next** for **Read Me File**.
  - d. Click **Next** to install to default **Destination Location**.
  - e. Click **Next** to **Start Installation**.
  - f. Click **Next** to place shortcut on desktop.
  - g. Click **Finish** to complete installation.
25. Move **smoking.dem** to **c:\SIERRA\Half-Life\valve\**.
26. Move the maps folder to **c:\SIERRA\Half-Life\valve\**.

*To run the benchmark:*

1. Insert CD in CD-ROM.
2. Execute **Half-Life Console** from start menu.
3. Click **Console**.
4. Eject CD from CD-ROM so that music does not play.
5. Type **timedemo smoking**.
6. Press **Enter** to launch demo.

**Quake III Demo2 (1024x768x32)**

1. Install *Quake III: Q3Ademo.exe*.
2. Click **Next** to install *Quake 3 Arena Demo*.
3. Click **Yes** to accept **License Agreement**.
4. Click **Next** to install to default **Destination Location**.
5. Click **Next** to install.
6. Click **Close** to complete setup.

*To run the benchmark:*

1. Execute **Quake3** from desktop.
2. Click **Setup**.
3. Click **System**.
4. Click **Video Mode** to select **1024x768**.
5. Click **Color Depth** to select **32 Bit**.
6. Click **Accept**.
7. Press Shift+ ~ for the console command view. Type the following commands to configure and run the demo:
  - a. **s\_initsound 0**
  - b. **snd\_restart**
  - c. Press Shift+ ~
  - d. **com\_maxfps 0**
  - e. **vid\_restart**
  - f. Press Shift+ ~
  - g. **timedemo 1**
  - h. **demo demo002**
8. Press **Enter** to launch demo.
9. Press Shift+ ~ to view results.

**RazorLAME Ver. 1.1.5**

1. Install **ezcddax6.exe** to convert ripping CD to .wav format.

2. Click **Next** to continue ripping from **Easy CD-DA Extractor Setup**.
3. Click **Next** to install program into default folder.
4. Click **Finish**.
5. Insert **Pink Floyd - Wish You Were Here** Audio CD into drive.
6. Go to **Start, Programs, Easy CD-DA Extractor 6**, and **Easy CD-DA Extractor**.
7. Click **Evaluate the Software**.
  - a. Select **Device** to **Hitachi GD-2000 1000** to reflect the CDROM is installed on the computer.
  - b. Select all tracks.
  - c. Click **Copy** to continue.
  - d. In the dialog box, change output folder to **C:\Pink Floyd**.
  - e. Go to **Integrated Formats** tab; choose **.wav (standard)** in the first drop down box.
  - f. Click **Start Copying** to copy files.
8. Burn the raw files to another CD.
9. Input the burned CD into the computer.
10. Choose folder **Pink Floyd**.
11. Copy folder from CD to desktop.
12. Install **lamewin32**.
13. Click **I Agree** to license agreement.
14. Click **Next** to install LAME Mp3.
15. Click **Install** to continue install.
16. Clicks **Close**.
17. Open **RazorLAME** shortcut on desktop.
18. Drag the **Pink Floyd** folder track items into **RazorLAME 1.1.5**.
19. Go to Edit menu, choose **Lame Options**.

20. Under General tab, increase Bit Rate to **192**.
21. Under Advanced tab, change Optimization to **Quality**.
22. Under VBR tab, select **Enable Variable BitRate** and change Quality Number to **9**.
23. Click **Ok** to close dialog box.
13. Install patch: **wolf\_1\_1.exe**.
14. Click **Next** to install *Return to Castle Wolfenstein* Patch.
15. Click **Yes** to accept License Agreement.
16. Click **Next** to install to default Destination Location.
17. Click **Next** to Start Installation.
18. Click **Ok** to continue installation.
19. Click **Finish** to complete installation.

*To run the benchmark:*

1. Click **Encode** to run benchmark.

*Note: To view results, Go to View, Last log, and scroll down to end of file. Before running a second run, delete all files from the RazorLAME and re-copy prior to starting run. You do not need to reset the options.*

### Return to Castle Wolfenstein 3D (1024x768x32)

1. Click **Install** and click **Next** to install *Return to Castle Wolfenstein*.
2. Click **Yes** to accept License Agreement.
3. Click **Next** for Minimum System Requirements.
4. Enter the registration key and click **Ok**.
5. Click **Ok** to confirm registration key.
6. Click **Next** to install to default Destination Location.
7. Click **Next** to install to default Program Folder.
8. Click **Install** to Start Installation.
9. Click **Ok** for Hardware Detected.
10. Click **Yes** to create shortcut on desktop.
11. Select **Register Later** and click **Next**.
12. Click **Finish** to complete setup.
20. Create a directory called **demos** in the **c:\Program Files\Return to Castle Wolfenstein\Main\Demos** and extract **checkpoint.dem\_57** to that directory.
21. Execute *Wolfenstein* (Multiplayer) from the desktop.
22. Click **Options, System, and Graphics**.
23. Select Video mode to **1024x768**.
24. Select Texture detail to **High**.
25. Click **Apply**.
26. Click **Yes** to apply video settings.
27. Under **Options, Game Options, and Performance**:
  - a. Select Wall Mark Lifetime to **Long**.
  - b. Select Ejecting Brass to **High**.
  - c. Select Dynamic Lights to **Yes**.
  - d. Select Corona Dist to **Extreme**.
28. Under Options/Game Options/View:
  - a. Select Cursor Hints to **Off**.
  - b. Select Show Compass to **Off**.
  - c. Select Team Overlay to **Off**.
29. Press **Esc** to return to main menu.
30. Click **Quit** to exit game.



*To run the benchmark:*

1. Execute *Wolfenstein* (Multiplayer) from the desktop.
2. Go into **Options, Game Options, Performance**, and set **Corona Dist to Extreme**.
3. Press Shift+ ~ to open the console.
4. Type **Timedemo 1**.
5. Type **Demo checkpoint**.
6. Press Shift+ ~ to view demo results.

**Serious Sam: Second Encounter – Demo Version (1024x768x32)**

1. Double Click to install *Serious Sam: serioussamsdemo.exe*.
2. Click **Next** to install *Serious Sam: The Second Encounter Demo*.
3. Click **Yes** to accept **License Agreement**.
4. Click **Next** for **Information text**.
5. Click **Next** to install to default **Destination Location**.
6. Click **Next** to install to default **Program Folder**.
7. Click **Next** to install default name for **ENTER text**.
8. Click **Finish** to complete installation.
9. Execute the *Serious Sam* program.
10. Click **Ok** to start *Serious Sam* for the first time.
11. Press Esc to enter the main menu.
12. Click **Options**, and **Video Options**.
13. Select **Resolution** to **1024x768**.
14. Select **Bits per pixel** to **32**.
15. Select **Preferences** to **Speed**.
16. Click **Apply**.
17. Click **Yes** to keep settings.

18. Press Esc to return to main menu.

*To run the benchmark:*

1. Launch *Serious Sam: Second Encounter* demo from desktop.
2. Press **Esc** to get to main menu.
3. Press Shift+ ~ to enter the console.
4. Type **dem\_bprofile=1**.
5. Press Shift+ ~ to return to main menu.
6. Click **Demo**.
7. Select **Little Trouble** demo and press Enter.
8. Following the demo, press Shift+ ~.

**Splinter Cell**

9. Install *Splinter Cell* from CD.
10. Click **Next** to continue.
11. Click **No** to update current version of DX9.0.
12. Click **Next** to accept license agreement.
13. Click **Next** to continue.
14. Click **Next** to continue.
15. Click **Next** to continue.
16. Insert Disc 2 and click **OK**.
17. Insert Disc 3 and click **OK**.
18. Click **Next** to continue.
19. Chose **Never Register** and Click **Cancel**.
20. Click **Finish**.
21. Double click to install patch **scus\_CA\_Patch\_1.2B** (version 7.1.100.124.8).
22. Click **Ok** to finish patch completion.
23. Go to **C:\Program Files\Ubisoft\Splinter Cell\System\sclow.bat**.

24. Right click **sclow.bat** and select menu item **Edit**.
25. Ensure the **sclow.bat** file reads as follows:

```
splintercell.exe 1_1_1Tbilisi.scl PLAYTIMEDEMO=1_1_1TbilisiDemo.bin -NOSOUND
RESOLUTION=1024X768 SHADOWLEVEL=LOW SHADOWRESOLUTION=LOW EFFECTSQUALITY=LOW
SHADOWMODE=PROJECTOR
splintercell.exe 1_1_1Tbilisi.scl PLAYTIMEDEMO=1_1_1TbilisiDemo.bin -NOSOUND
RESOLUTION=1024X768 SHADOWLEVEL=LOW SHADOWRESOLUTION=LOW EFFECTSQUALITY=LOW
SHADOWMODE=PROJECTOR
splintercell.exe 1_1_1Tbilisi.scl PLAYTIMEDEMO=1_1_1TbilisiDemo.bin -NOSOUND
RESOLUTION=1024X768 SHADOWLEVEL=LOW SHADOWRESOLUTION=LOW EFFECTSQUALITY=LOW
SHADOWMODE=PROJECTOR
splintercell.exe 1_1_2Tbilisi.scl PLAYTIMEDEMO=1_1_2TbilisiDemo.bin -NOSOUND
RESOLUTION=1024X768 SHADOWLEVEL=LOW SHADOWRESOLUTION=LOW EFFECTSQUALITY=LOW
SHADOWMODE=PROJECTOR
splintercell.exe 1_1_2Tbilisi.scl PLAYTIMEDEMO=1_1_2TbilisiDemo.bin -NOSOUND
RESOLUTION=1024X768 SHADOWLEVEL=LOW SHADOWRESOLUTION=LOW EFFECTSQUALITY=LOW
SHADOWMODE=PROJECTOR
splintercell.exe 1_1_2Tbilisi.scl PLAYTIMEDEMO=1_1_2TbilisiDemo.bin -NOSOUND
RESOLUTION=1024X768 SHADOWLEVEL=LOW SHADOWRESOLUTION=LOW EFFECTSQUALITY=LOW
SHADOWMODE=PROJECTOR
```

*To run the benchmark:*

1. Create a shortcut to the batch files stored in the directory noted above.
2. Input *Splinter Cell* CD3 into drive.
3. Double click the file on the desktop.

### Star Wars – Jedi Knight II: Jedi Outcast (1024x768x32)

1. Click **Install** to install *Jedi Knight II*.
2. Click **Next** to install *Jedi Knight II: Jedi Outcast*.
3. Click **Yes** to accept License Agreement.
4. Click **Automatic** installation.
5. Click **Yes** to confirm automatic installation.
6. Click **Exit** installation.
7. Install patch **Jkiiup104.exe**.
8. Click **Continue** to install.
9. Click **OK** to continue.
10. Unzip **assets2.pak3** found in **\GameData\Base** folder.
11. Extract the file **jk2ffa.dm\_15** to the **\Base\Demos** folder and then rename the demo to **jk2ffa.dm\_16**.
12. Copy the renamed demo file to a new directory, **Demos** off of the path **c:\program Files\LucasArts\Star Wars JK II Jedi Outcast\GameData\base**.
13. Create shortcut to desktop for *Jedi Knight II* Multi Player: **c:\Program Files\LucasArts\Star Wars JK II Jedi Outcast\GameData\jk2mp.exe**.
14. Right click **Shortcut to jk2mp** from desktop and select **Properties**.

15. Type **+set sv\_cheats 1** at the end of the **Target Location** for example  
**c:\Program Files\LucasArts\Star Wars JK II Jedi Outcast\GameData\jk2mp.exe +set sv\_cheats 1.**
16. Click **Ok** to close shortcut.
17. Run demo from the command line in the multiplayer game by typing **timedemo 1** and then **demo jk2ffa.**

*To run the benchmark:*

1. Execute the shortcut to **jk2mp** from the desktop.
2. Click **Setup**.
3. Click **Video**.
4. Select **1024x768x32** for Video Mode and **32-bit** for Color Depth.
5. Click **Apply Changes**.
6. Click **Yes** to continue to Main Menu.
7. Press Shift+ ~.
8. Type **timedemo 1**.
9. Type **demo jk2ffa.**
10. Press Enter.
11. Press Shift+ ~ and scroll up to see score.

### Unreal Tournament 2003 (1024x768x32)

1. Install *Unreal Tournament 2003* **ut2003demo2206.exe**.
2. Click **Next** to install *Unreal Tournament 2003*.
3. Click **I Agree** to accept License Agreement.
4. Click **Next** to install to default Destination Location.
5. Click **Next** to install default components.

6. Click **Install** to install *Unreal Tournament 2003*.
7. Click **Finish** to complete installation.

*To run the benchmark:*

1. Run **c:\UT2003Demo\System\Benchmark.exe**.
2. Select **1024x768** and click **Start** to launch the demo.

### WinRAR

1. Install **activePerl-5.8.0.806-mswin32-x86**
2. Click **Next** to begin install.
3. Choose **I accept the terms in the license agreement** and click **Next**.
4. Click **Next** for default install.
5. Click **Next** on the privacy policy.
6. Click **Next** to accept the default options.
7. Click **Install** to continue.
8. Click **Finish** to complete install.
9. Install **winrar320** from CD.
10. Click **Install** to continue.
11. Click **Ok** to default setup.
12. Click **Done** to complete install.
13. Double-click **My computer** and select C:\ Drive
14. Click **File** menu, choose **New folder** and create **rartest**.
15. Copy **rartestpl** file from CD to new folder.

*To run the benchmark:*

1. Double click the **rartestpl** file which creates a directory with a text file with the test results.

## XMPEG

1. Install *DIVX* from CD folder **DIVX5.03pro**.
2. Click **Next** to begin installation.
3. Click **Next** to Welcome note.
4. Click **Next** to Requirements note.
5. Click **Yes** to license agreement.
6. Click **Yes** twice for the privacy agreement.
7. Select **Custom** for Type of Setup Program and click **Next**.
8. Click **Next** to continue.
9. Click **Next** to select default location.
10. Click **Next** to install.
11. Click **Close** upon install.
12. Reboot the system.
13. Install **xmpeg\_5.02\_setup.exe** from CD.
14. Choose **English** and click **Next** for language selection.
15. Click **Next** to Welcome note.
16. Click **Next** to Readme information.
17. Click **Next** to choose destination location for install.
18. Click **Next** to default folder settings.
19. Click **Next** to start file copy.
20. Click **Finish** to complete file copy.
21. Click **Ok** to illegal information.
22. Click **Cancel** to stop video conversion wizard for manual start.
23. Click on the reel icon to the left hand side of the **XMPEG** title bar.
24. Select **Open**.
25. Go to desktop and open the **testfile** that was created under AVI MPG (See "bbmpeg (raw AVI to MPEG2)" on page 34).
26. Click **Ok**.
27. Select **Options** from the menu.
28. Under **Video** tab, deselect **Auto** and select **YUY2**.
29. Under **Audio** tab, deselect **Same as Input** and select **48000 Hz**.
30. Go to menu and choose **Set Plug-In Options**.
31. Under Advanced tab, select **benchmark mode** and type **5400** for number of frames asked.
32. Click **Ok**.

### *To run the benchmark:*

1. Go to menu and choose **Start Conversion**.

## AMD's Results

Using the system configuration and benchmark configuration and testing methods recommended on page 33, AMD's results are presented in the following graphs. Contact AMD if you have any questions about the performance of any AMD microprocessor.

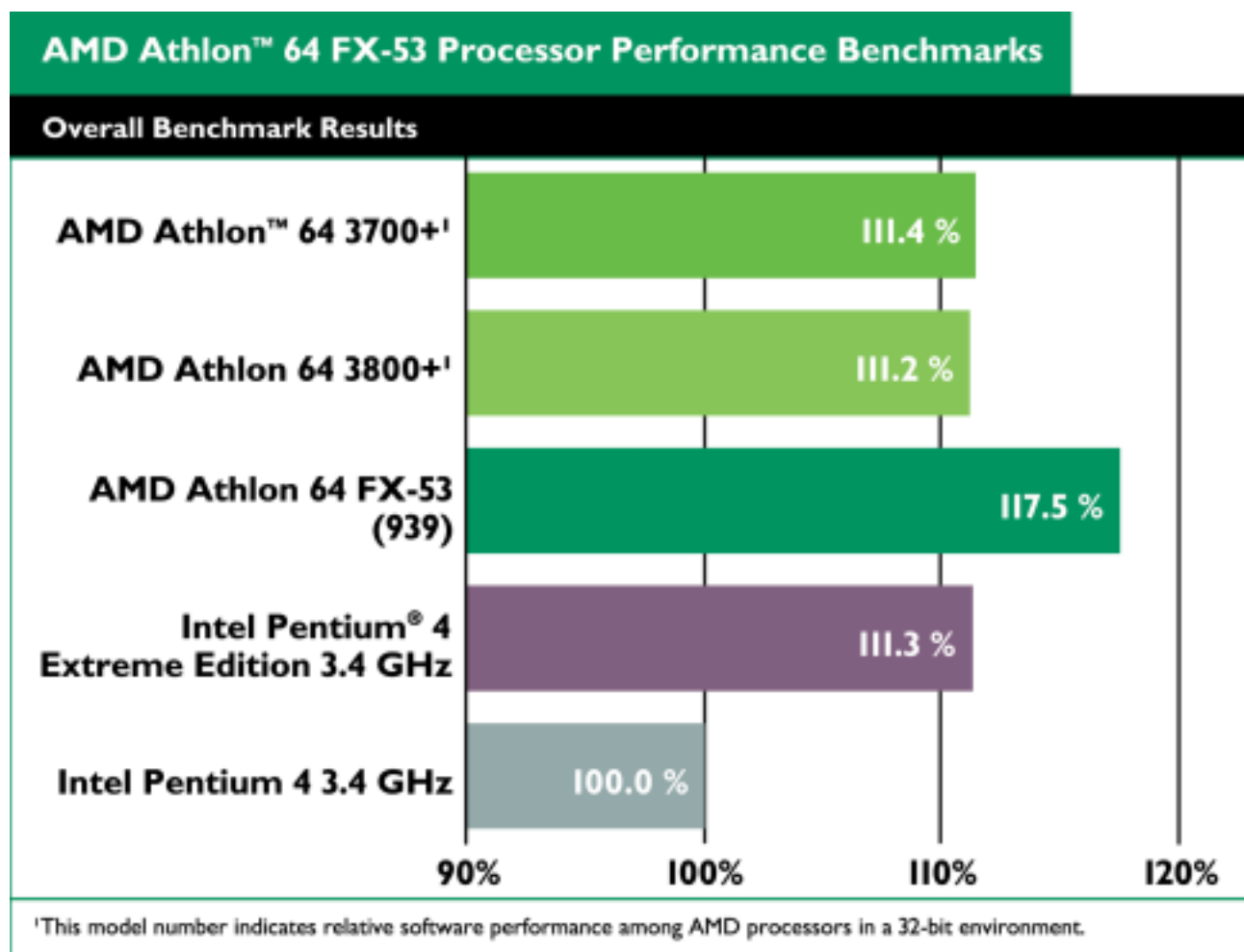


Figure 3. AMD Athlon™ 64 FX-53 Processor Overall

Table 5. Productivity Overall

AMD Athlon™ 64 3700+ <sup>1</sup>	111.4%
AMD Athlon 64 3800+ <sup>1</sup>	111.2%
AMD Athlon 64 FX-53	117.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	111.3%
Intel Pentium 4 3.4 GHz	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

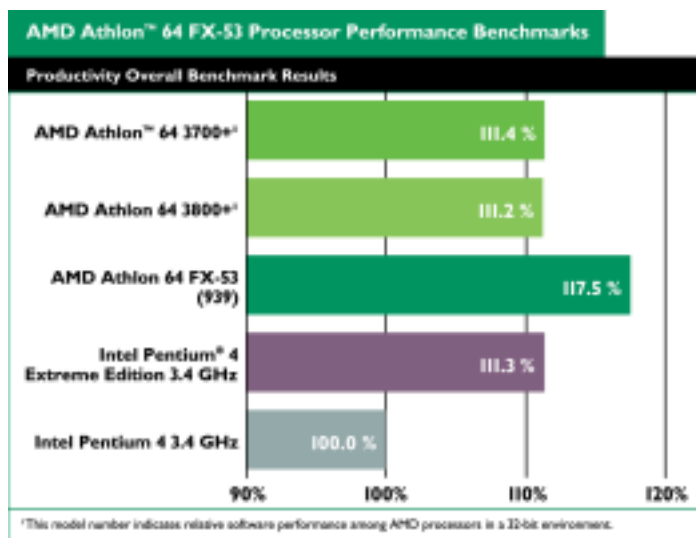
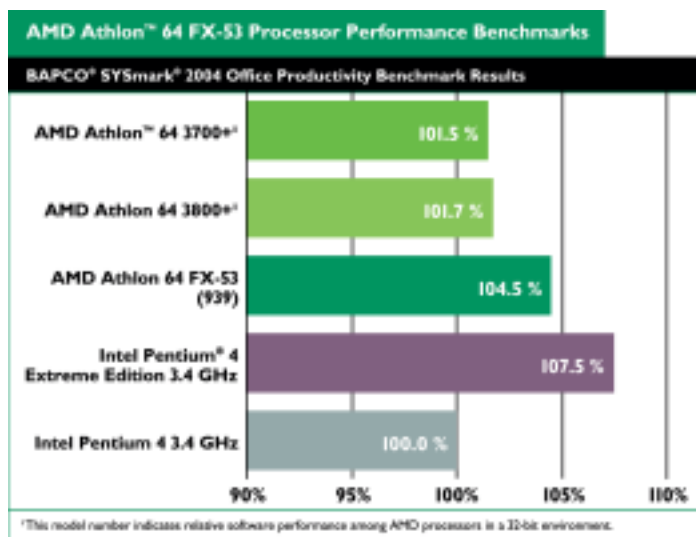


Table 6. BAPCO® SYSmark® 2004 Productivity

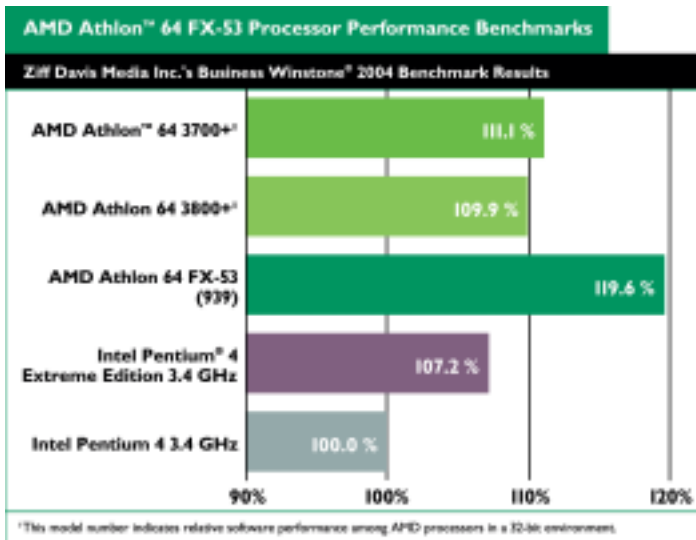
Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	203.0	101.5%
AMD Athlon 64 3800+ <sup>1</sup>	203.3	101.7%
AMD Athlon 64 FX-53	209.0	104.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	215.0	107.5%
Intel Pentium 4 3.4 GHz	200.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.


Table 7. Ziff Davis Media Inc.'s Business Winstone® 2004 v1.0<sup>1</sup>

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	28.4	111.1%
AMD Athlon 64 3800+ <sup>1</sup>	28.1	109.9%
AMD Athlon 64 FX-53	30.6	119.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	27.4	107.2%
Intel Pentium 4 3.4 GHz	25.6	100.0%

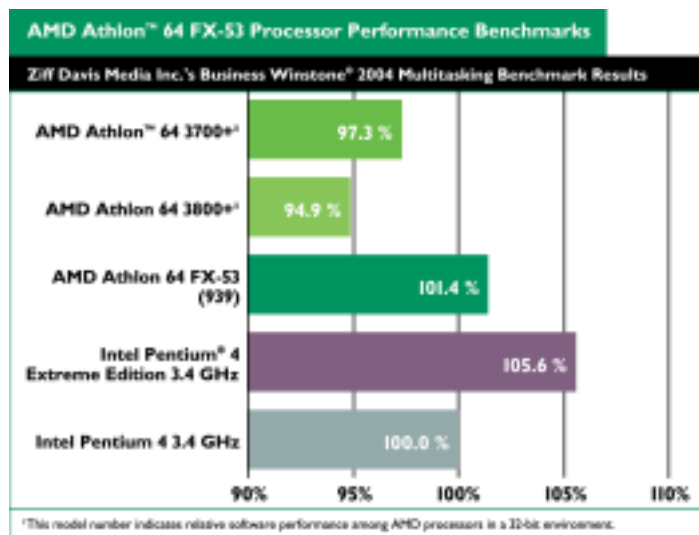
<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



**Table 8. Ziff Davis Media Inc.'s Business Winstone® 2004 Multitasking<sup>1</sup>**

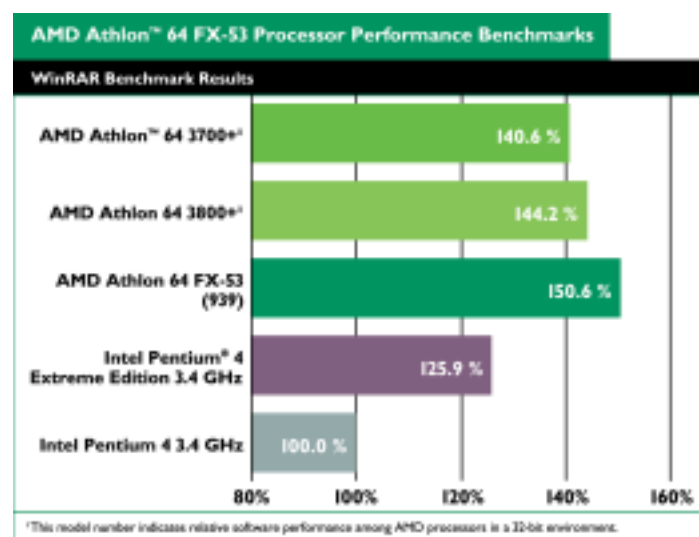
Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	3.2	97.3%
AMD Athlon 64 3800+ <sup>1</sup>	3.1	94.9%
AMD Athlon 64 FX-53	3.3	101.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3.5	105.6%
Intel Pentium 4 3.4 GHz	3.3	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.


**Table 9. WinRAR Overall**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	19.6	140.6%
AMD Athlon 64 3800+ <sup>1</sup>	19.1	144.2%
AMD Athlon 64 FX-53	18.3	150.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	21.9	125.9%
Intel Pentium 4 3.4 GHz	27.6	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



<sup>1</sup> Tests performed without independent verification by the VeriTest testing division of Lionbridge Technologies Inc. (VeriTest) nor Ziff Davis Media Inc. and that neither Ziff Davis Media Inc. nor VeriTest make any representations or warranties as to the results of the tests.

Table 10. Digital Media Overall

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	102.1%
AMD Athlon 64 3800+ <sup>1</sup>	104.6%
AMD Athlon 64 FX-53	107.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	103.0%
Intel Pentium 4 3.4 GHz	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

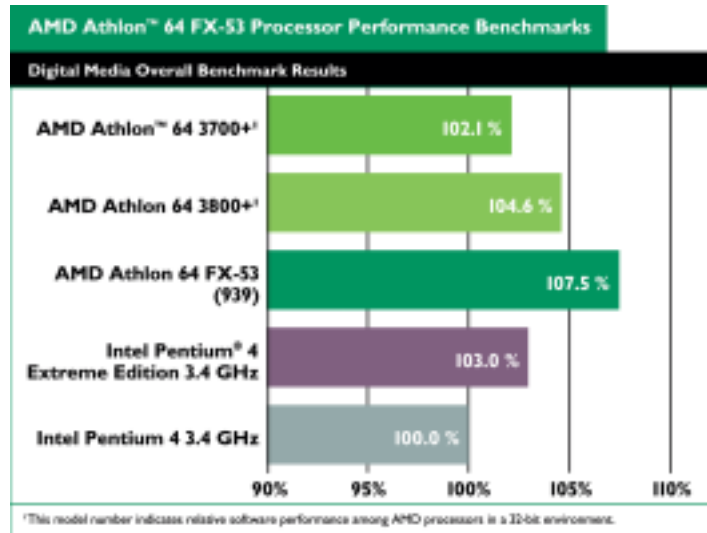


Table 11. BAPCO® SYSmark® 2004 Internet Content Creation

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	222.0	97.8%
AMD Athlon 64 3800+ <sup>1</sup>	225.7	99.4%
AMD Athlon 64 FX-53	231.0	101.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	234.3	103.2%
Intel Pentium 4 3.4 GHz	227.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

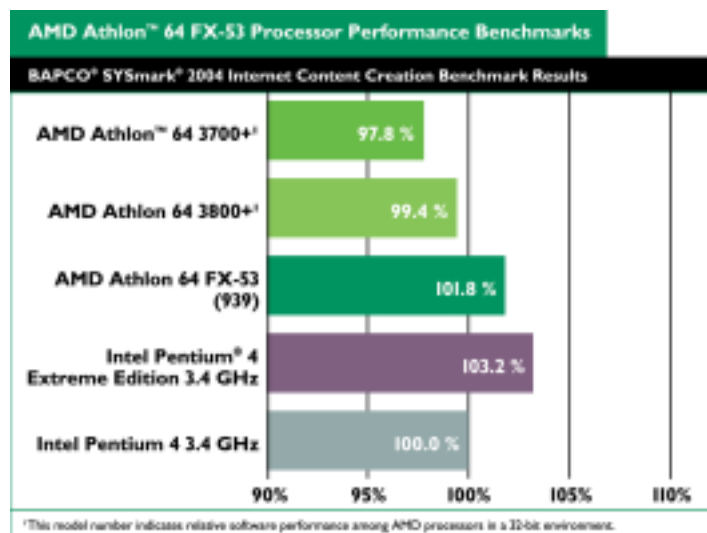


Table 12. Content Creation Winstone® 2004 v1.0

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	35.2	107.7%
AMD Athlon 64 3800+ <sup>1</sup>	36.3	111.1%
AMD Athlon 64 FX-53	39.8	121.7%
Intel Pentium® 4 Extreme Edition 3.4 GHz	34.3	104.9%
Intel Pentium 4 3.4 GHz	32.7	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

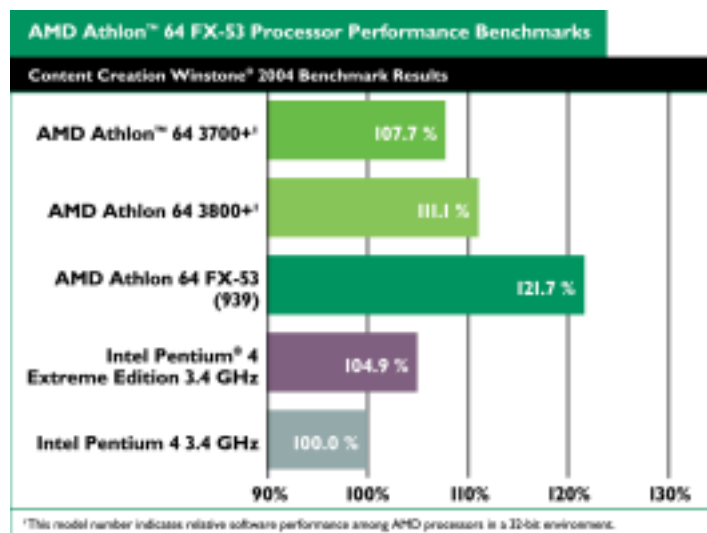




Table 13. Raw AVI to Mpeg2

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	488.7	104.2%
AMD Athlon 64 3800+ <sup>1</sup>	470.7	108.1%
AMD Athlon 64 FX-53	467.0	109.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	495.3	102.8%
Intel Pentium 4 3.4 GHz	509.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

Table 14. Xmpeg 5.02

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	142.7	101.4%
AMD Athlon 64 3800+ <sup>1</sup>	137.6	105.1%
AMD Athlon 64 FX-53	136.3	106.2%
Intel Pentium® 4 Extreme Edition 3.4 GHz	140.0	103.3%
Intel Pentium 4 3.4 GHz	144.6	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

Table 15. RazorLAME 1.1.5 MP3 Encoder

AMD Athlon™ 64 3700+ <sup>1</sup>	240.0	99.6%
AMD Athlon 64 3800+ <sup>1</sup>	240.0	99.6%
AMD Athlon 64 FX-53	239.0	100.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	237.0	100.8%
Intel Pentium 4 3.4 GHz	239.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

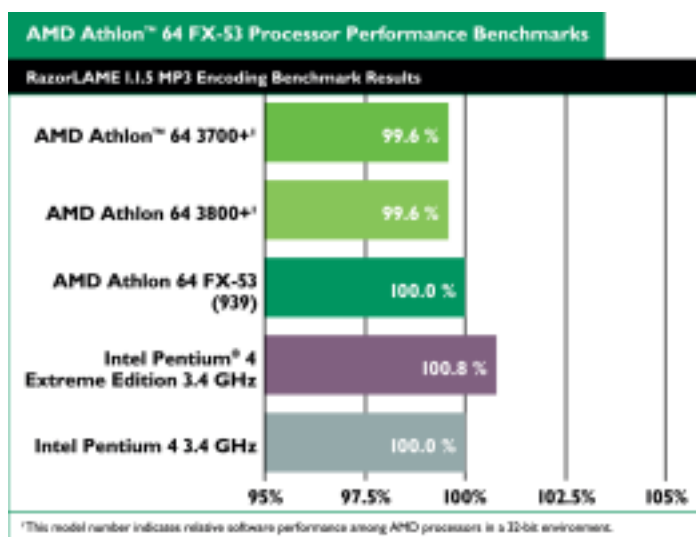
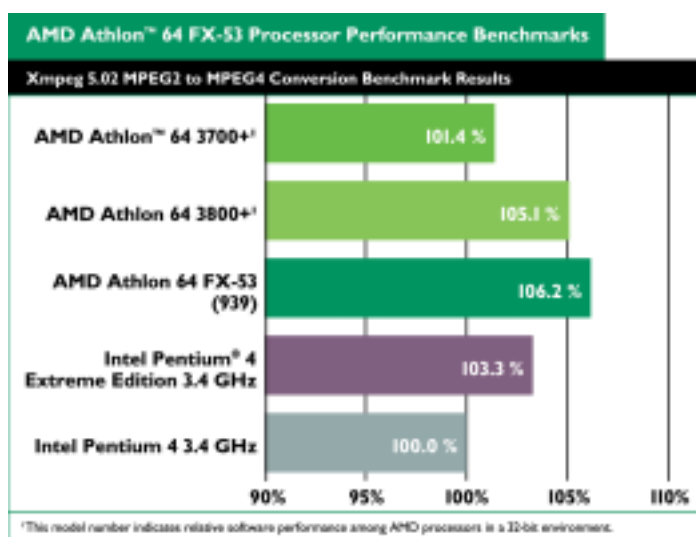
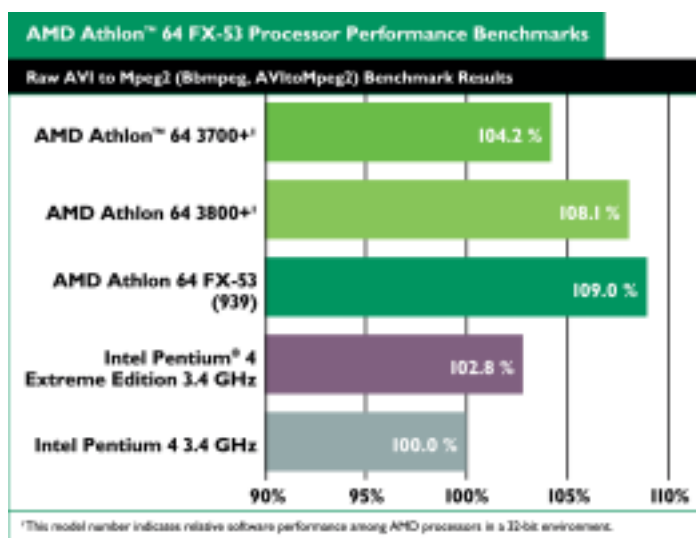


Table 16. 3D Gaming Overall

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	115.5%
AMD Athlon 64 3800+ <sup>1</sup>	117.2%
AMD Athlon 64 FX-53	119.3%
Intel Pentium® 4 Extreme Edition 3.4 GHz	110.2%
Intel Pentium 4 3.4 GHz	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

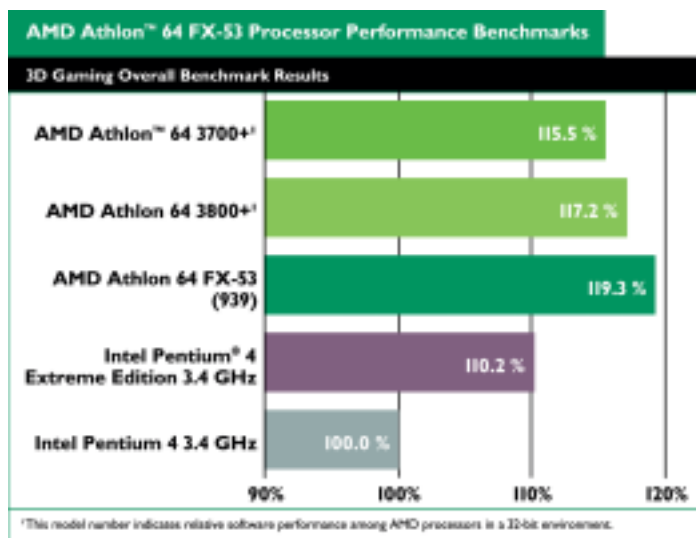


Table 17. Futuremark Corporation 3DMark® 2001SE (D3D Hardware T&amp;L)

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	20200.3	114.5%
AMD Athlon 64 3800+ <sup>1</sup>	20303.0	115.1%
AMD Athlon 64 FX-53	20465.7	116.1%
Intel Pentium® 4 Extreme Edition 3.4 GHz	19191.7	108.8%
Intel Pentium 4 3.4 GHz	17635.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

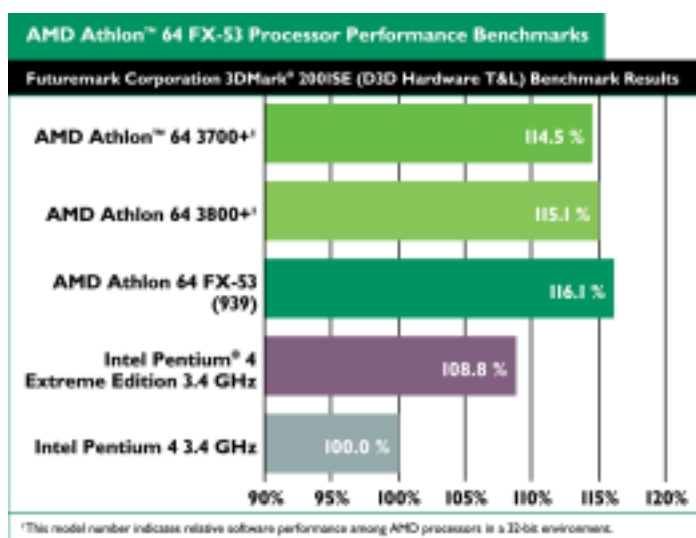
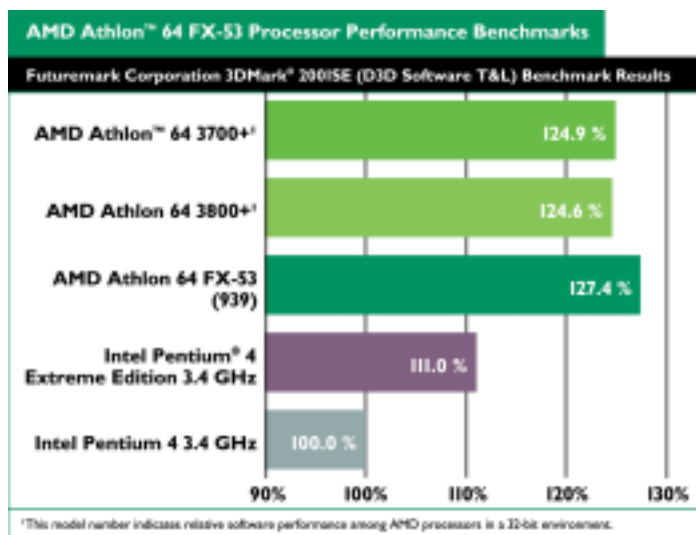


Table 18. Futuremark Corporation 3DMark® 2001SE (D3D Software T&amp;L)

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	10281.3	124.9%
AMD Athlon 64 3800+ <sup>1</sup>	10262.0	124.6%
AMD Athlon 64 FX-53	10488.3	127.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	9141.7	111.0%
Intel Pentium 4 3.4 GHz	8234.0	100.0%

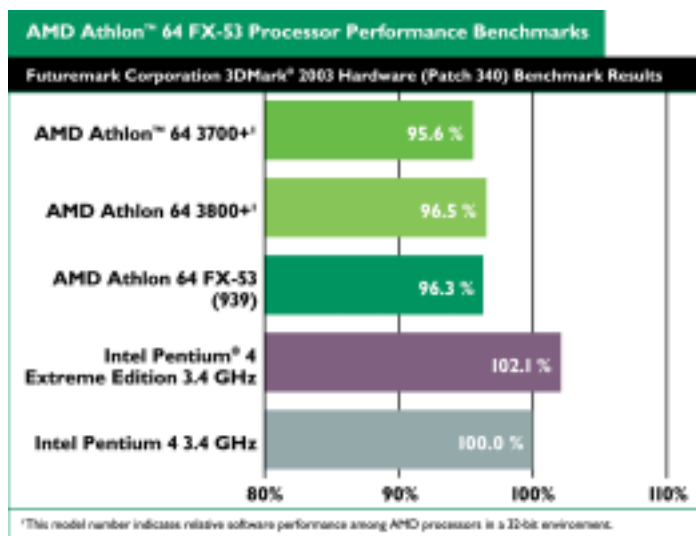
<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



**Table 19. Futuremark Corporation  
3DMark® 2003 (Hardware)  
(Patch 340)**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	6305.0	95.6%
AMD Athlon 64 3800+ <sup>1</sup>	6362.0	96.5%
AMD Athlon 64 FX-53	6348.3	96.3%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6735.7	102.1%
Intel Pentium 4 3.4 GHz	6594.3	100.0%

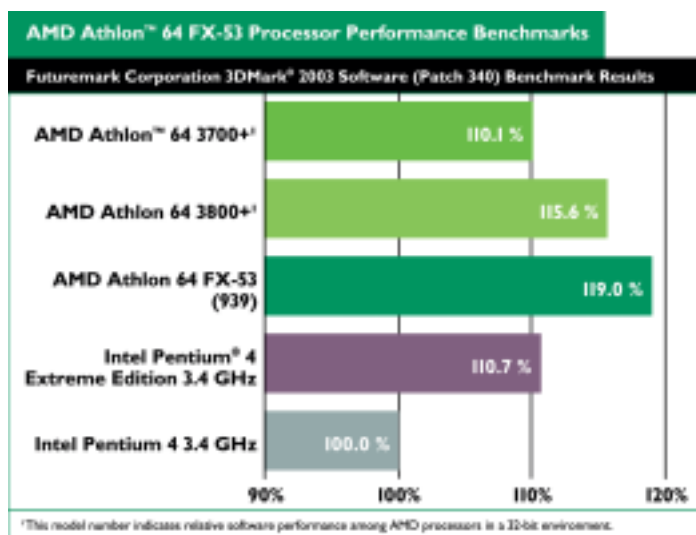
<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



**Table 20. Futuremark Corporation  
3DMark® 2003 (Software)  
(Patch 340)**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	3024.0	110.1%
AMD Athlon 64 3800+ <sup>1</sup>	3173.3	115.6%
AMD Athlon 64 FX-53	3267.7	119.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3040.3	110.7%
Intel Pentium 4 3.4 GHz	2746.0	100.0%

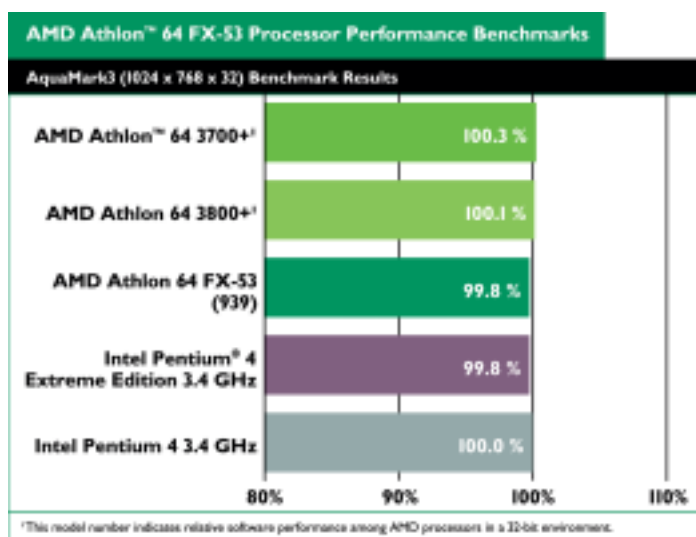
<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



**Table 21. Aquamark3 (FPS)**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	45.04	100.3%
AMD Athlon 64 3800+ <sup>1</sup>	44.95	100.1%
AMD Athlon 64 FX-53	44.81	99.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	44.82	99.8%
Intel Pentium 4 3.4 GHz	44.89	100.0%

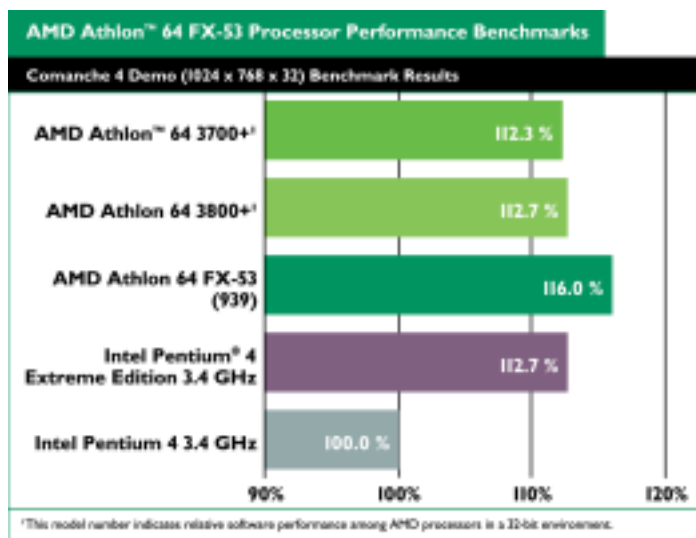
<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



**Table 22. Comanche 4 Demo (1024 x 768 x 32)**

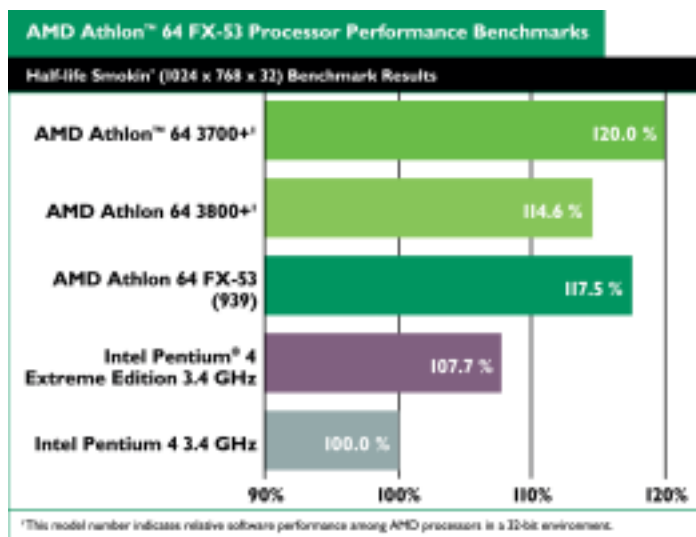
Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	79.0	112.3%
AMD Athlon 64 3800+ <sup>1</sup>	79.3	112.7%
AMD Athlon 64 FX-53	81.6	116.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	79.3	112.7%
Intel Pentium 4 3.4 GHz	70.3	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.


**Table 23. Half-life Smokin' (1024 x 768 x 32)**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	143.6	120.0%
AMD Athlon 64 3800+ <sup>1</sup>	137.1	114.6%
AMD Athlon 64 FX-53	140.6	117.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	128.9	107.7%
Intel Pentium 4 3.4 GHz	119.7	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.


**Table 24. Jedi Knights II Demo**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	194.7	103.0%
AMD Athlon 64 3800+ <sup>1</sup>	207.9	110.0%
AMD Athlon 64 FX-53	208.4	110.2%
Intel Pentium® 4 Extreme Edition 3.4 GHz	210.0	111.1%
Intel Pentium 4 3.4 GHz	189.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

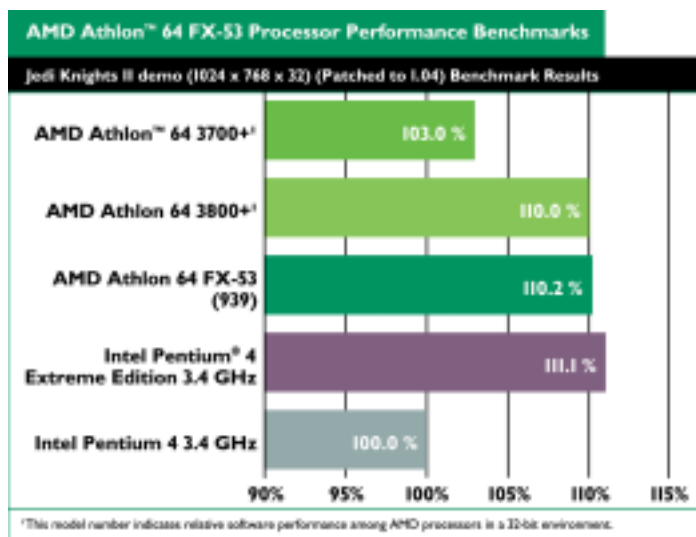


Table 25. QuakeIII Demo2

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	450.8	109.2%
AMD Athlon 64 3800+ <sup>1</sup>	449.6	109.0%
AMD Athlon 64 FX-53	461.2	111.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	497.8	120.6%
Intel Pentium 4 3.4 GHz	412.6	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

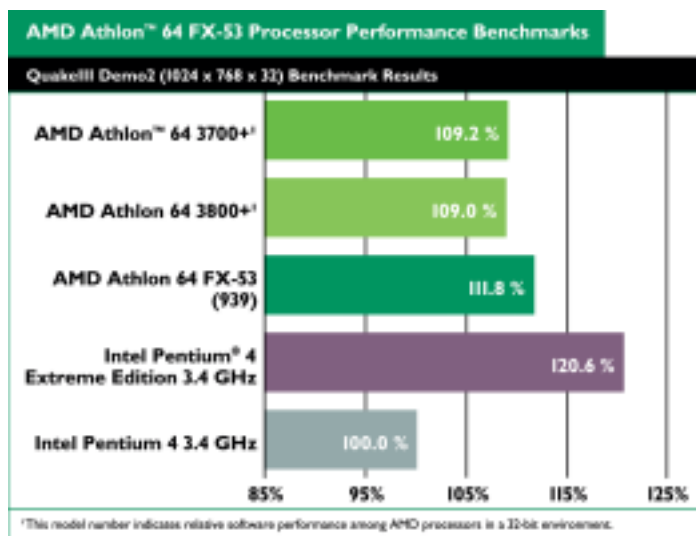


Table 26. Return to Castle Wolfenstein 3D

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	152.3	107.2%
AMD Athlon 64 3800+ <sup>1</sup>	158.0	111.2%
AMD Athlon 64 FX-53	157.3	110.7%
Intel Pentium® 4 Extreme Edition 3.4 GHz	153.6	108.1%
Intel Pentium 4 3.4 GHz	142.1	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

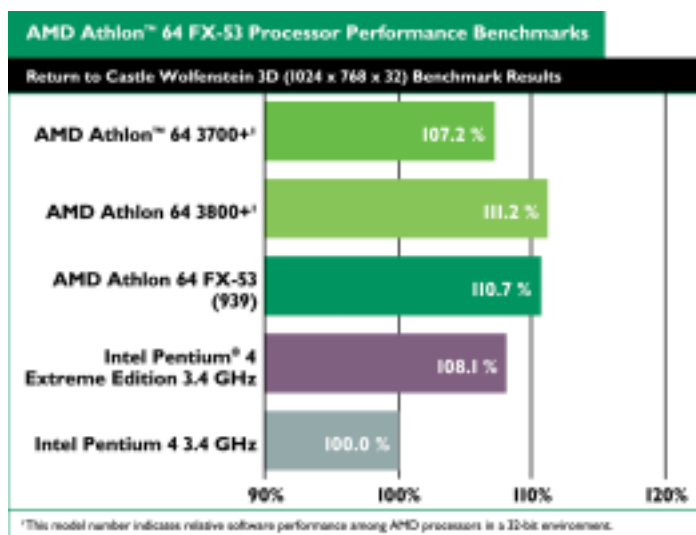


Table 27. Serious Sam: Second Encounter - Demo Version

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	281.6	126.2%
AMD Athlon 64 3800+ <sup>1</sup>	281.0	125.9%
AMD Athlon 64 FX-53	294.9	132.1%
Intel Pentium® 4 Extreme Edition 3.4 GHz	252.9	113.3%
Intel Pentium 4 3.4 GHz	223.2	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

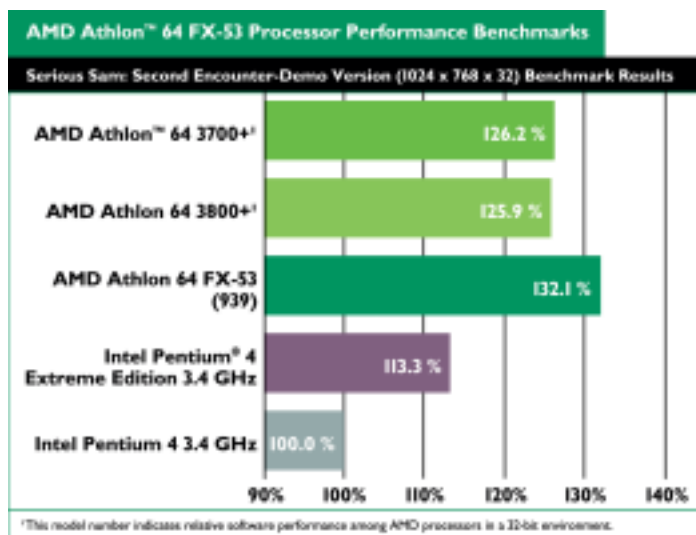


Table 28. Unreal Tournament 2003 Flyby

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	289.0	115.5%
AMD Athlon 64 3800+ <sup>1</sup>	295.7	118.2%
AMD Athlon 64 FX-53	298.7	119.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	274.9	109.9%
Intel Pentium 4 3.4 GHz	250.2	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.

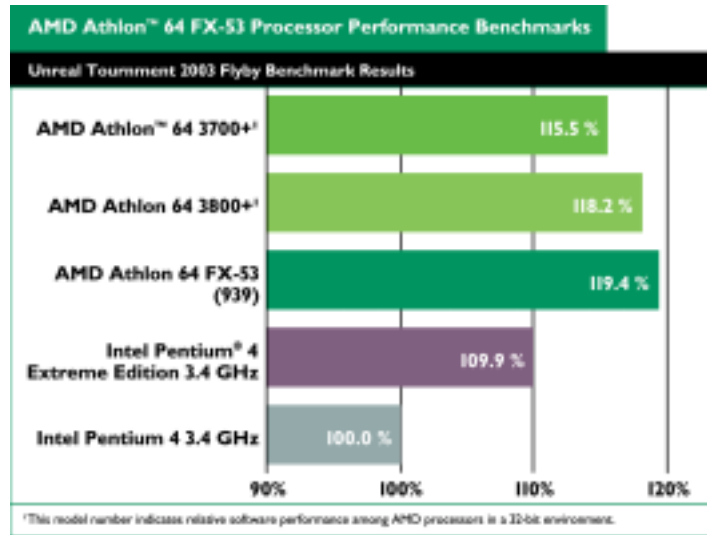
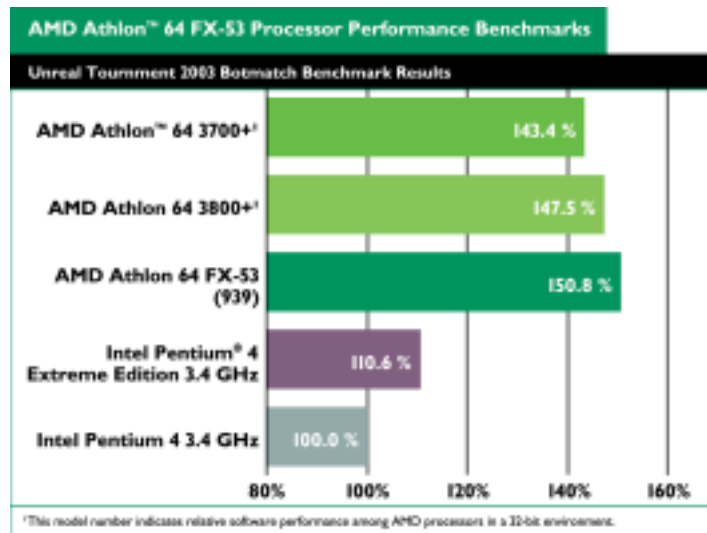


Table 29. Unreal Tournament 2003 Botmatch

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	111.6	143.4%
AMD Athlon 64 3800+ <sup>1</sup>	114.7	147.5%
AMD Athlon 64 FX-53	117.3	150.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	86.0	110.6%
Intel Pentium 4 3.4 GHz	77.8	100.0%

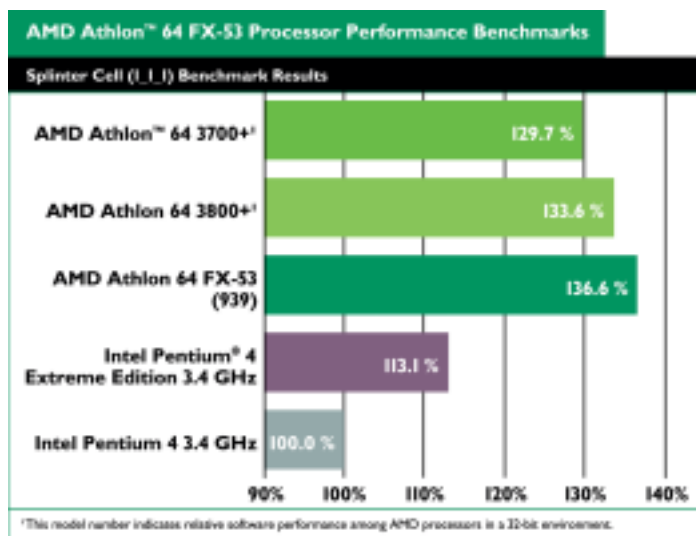
<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.



**Table 30. Splinter Cell (1\_1\_1)**

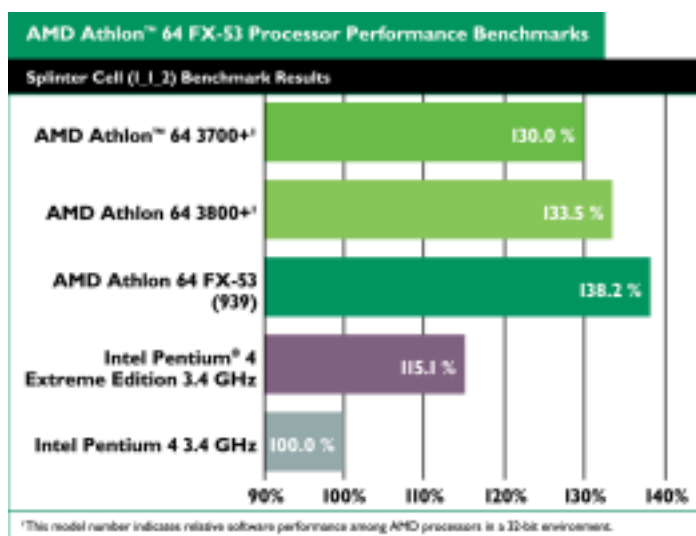
Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	107.7	129.7%
AMD Athlon 64 3800+ <sup>1</sup>	110.9	133.6%
AMD Athlon 64 FX-53	113.5	136.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	93.9	113.1%
Intel Pentium 4 3.4 GHz	83.1	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.


**Table 31. Splinter Cell (1\_1\_2)**

Processor	Score	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	102.7	130.0%
AMD Athlon 64 3800+ <sup>1</sup>	105.5	133.5%
AMD Athlon 64 FX-53	109.2	138.2%
Intel Pentium® 4 Extreme Edition 3.4 GHz	90.9	115.1%
Intel Pentium 4 3.4 GHz	79.0	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors in a 32-bit environment.









# AMD's Performance Analysis Tools

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This is the first in a series of releases of AMD performance analysis tools and is intended to help measure and analyze the 32-bit and 64-bit performance of AMD Athlon™ 64 and AMD Athlon 64 FX processor-based systems using Microsoft® Windows® operating system products. The 32-bit benchmarks are run on Windows XP service pack 1A and a beta release of Windows 64. The 64-bit applications are run under the Beta release of the Windows 64 operating system.

## Analysis Tools Benchmarks

AMD's performance analysis tools use various standard benchmarks to obtain relative performance numbers. When combined with the suggested setup configurations, reviewers and enthusiasts alike should be able to recreate AMD's reported results.

### DivX Encoder

The DivX encoder benchmark contains both a 32-bit and a 64-bit benchmark that measures the performance of raw video encoding of the AMD optimized DivX video encoder version 503. The encoder has been optimized for AMD Athlon 64 and AMD Athlon 64 FX processor-based systems (both 32-bit and 64-bit).

### Mini-GZIP

The Mini-GZIP benchmark contains a 64-bit benchmark that measures the performance of an AMD64-optimized version of ZLIB. It also contains a 32-bit benchmark implemented with the standard (unmodified) ZLIB. The source code for this benchmark is included on the CD.

### RSA

The RSA benchmarks consist of a set of 32-bit and 64-bit executables that measure the performance of key RSA cryptography routines. The 64-bit executables use RSA code that has been optimized for AMD64 technology. There are a set of 32-bit executables that have also been optimized for AMD64 technology and a set of 32-bit executables using the standard RSA library routines.

## Streams

The Streams benchmarks consist of 32-bit and 64-bit executables that have been optimized for AMD64 technology.

## Blobby Dancer

The Blobby dancer is a NURB-based person that dances. The benchmark consists of 32-bit and 64-bit executables.

## Panorama Factory

Panorama factory is an image stitching program that allows a user to stitch together digital photo images to create a single larger image. The benchmark utilizes Panorama Factory to stitch together 4 large images.

## Crafty

Crafty is a high performance computer chess program. It is listed on several internet chess forums as one of the strongest chess engines available. Crafty is open source and authored by Robert Hyatt.

<http://www.cis.uab.edu/info/faculty/hyatt/hyatt.html>

*Note: These executables have not been optimized for any other microprocessor. They do not run on processors without SSE2 support like the AMD Athlon™ XP processor.*

# Benchmark Installation and Testing

## Test Installation and Testing

1. Place the CD in the drive and read the instructions when the HTML page is displayed.
2. Close the HTML page.
3. Change to the **\DivxEncoderBenchmark** folder.
4. Copy the **DivxEncoderBenchmark** directory (inside the Contents folder) from the DVD to the root of the C: drive.
5. Click on the **Start** button and then select **Run** and type cmd.
6. Use the command: cd C:\DivxEncoderBenchmark.

## Divx Encoder

1. Open an explorer window that displays the contents of the DVD.
2. Change to the **Contents** Folder.

7. For 32-bit: Type **em503-32 amd\_638\_final\_0916.yuv** to start the encoder benchmark.
8. For 64-bit: Type **em503-64 amd\_638\_final\_0916.yuv** to start the encoder benchmark.

## Mini\_GZIP

1. Copy the **minigzip** directory (inside the Contents folder) from the DVD to the root of the C: drive.
2. Click on the **Start** button and then select **Run** and type cmd.
3. Use the command: cd C:\minigzip.
4. For 32-bit: Type **minigzip32 -f -6 data.txt** to start the compression benchmark.
5. For 64-bit: Type **minigzip64 -f -6 data.txt** to start the compression benchmark.

## BlobbyDancer

1. Copy the **\BlobbyDancer** directory (inside the Contents folder) from the DVD to the root of the C: drive.
2. Open My Computer and browse to the BlobbyDancer directory on the hard drive.
3. For 32-bit: double-click on BlobbyTestBatchFile32bit.bat to start the benchmark.
4. For 64-bit: double-click on BlobbyTestBatchFile64bit.bat to start the benchmark.
5. After the benchmark has completed the results will be displayed in the blobby\_average.log in the BlobbyDancer directory.

## RSA

1. Copy the **RSA** directory (inside the Contents folder) from the DVD to the root of the C: drive.
2. Click on the **Start** button and then select **Run** and type cmd.
3. For 32-bit: Type **cd C:\RSA\32-bit** and then type **dir**. Type any one of the files listed to execute the benchmark.
4. For 64-bit: Type **cd C:\RSA\64-bit** and then type **dir**. Type any one of the files listed to execute the benchmark.
5. After the benchmark has completed the results will be displayed as shown in the window.

## Streams

1. Copy the **Streams** directory (inside the Contents folder) from the DVD to the root of the C: drive.
2. Click on the **Start** button and then select **Run** and type cmd.
3. Use the command: cd C:\Streams
4. For 32-bit: Type **stream\_d32.exe** to start the benchmark.
5. For 64-bit: Type **stream\_d64.exe** to start the benchmark.
6. After the benchmark has completed the results will be displayed in the window.

## Panorama Factory

1. Insert the Panorama Factory DVD into the DVD drive.
2. The demo will start automatically.
3. To perform a 32-bit test with 4 images select option 3.
4. To perform a 64-bit test with 4 images select option 4.

5. The test will then install Panorama factory on the system, if required, and run the test to completion.
6. Obtain the tests results by selecting tools and timers form the main window.
7. The test completion time is listed as the wizard time.

## **Crafty**

1. Copy the Crafty files form the Crafty directory to a hard drive.
2. To benchmark crafty double click the bmark\_Crafty.bat.
3. After execution a crafty.csv file is created that lists the results from all three runs.
4. Crafty speed is measured in nodes per second.

## AMD's Results

AMD's analysis tools results are shown here. AMD used the system and operating system configurations shown earlier in this document to achieve these results. The results are presented as 64-bit performance within the AMD family of processors, and also as 64-bit and 32-bit relative performance. The 64-bit and 32-bit charts (as applicable) use the configurations found in:

- Table 1 "AMD Athlon™ 64 Processor 3700+ System Configuration" on page 21
- Table 2 "AMD Athlon™ 64 Processor 3800+ System Configuration" on page 21
- Table 3 "AMD Athlon™ 64 FX-53 Processor System Configuration" on page 22
- Table 4 "Intel Pentium® 4 Processor 3.4 GHz and Extreme Edition 3.4 GHz System Configurations" on page 23

For the AMD Athlon™ 64 FX-53, 3800+ and 3700+ processors, AMD used Microsoft® Windows® in both 32- and 64-bit computing environments. Contact AMD if you have any questions about the performance of any AMD microprocessor.

## AMD's 64-Bit Performance Results

Table 32. MiniGzip 64 Benchmark Results

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	214.3%
AMD Athlon 64 3800+ <sup>1</sup>	208.4%
AMD Athlon 64 FX-53	215.4%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

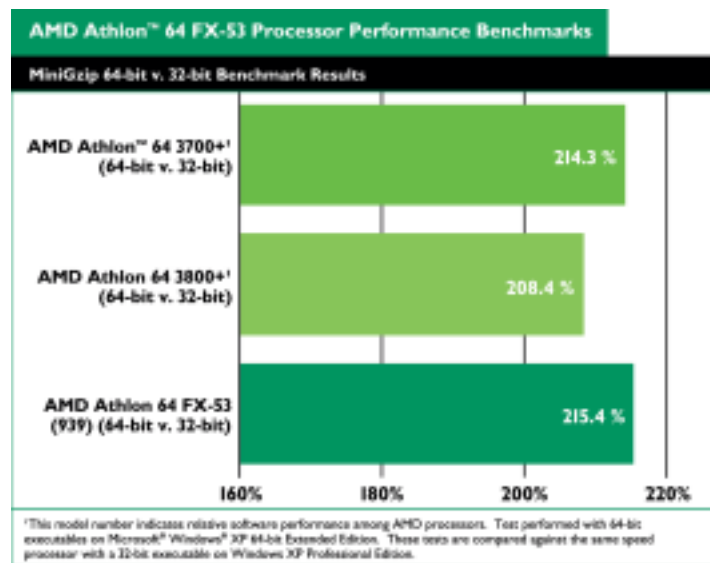


Table 33. MiniGUNZip 64 Benchmark

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	256.9%
AMD Athlon 64 3800+ <sup>1</sup>	254.0%
AMD Athlon 64 FX-53	254.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

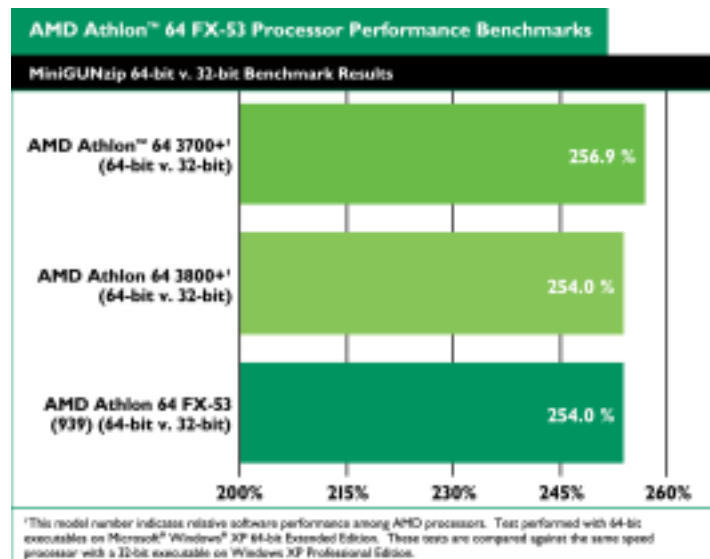


Table 34. AES-128 Encrypt 64 (sec)

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	272.8%
AMD Athlon 64 3800+ <sup>1</sup>	274.4%
AMD Athlon 64 FX-53	277.6%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

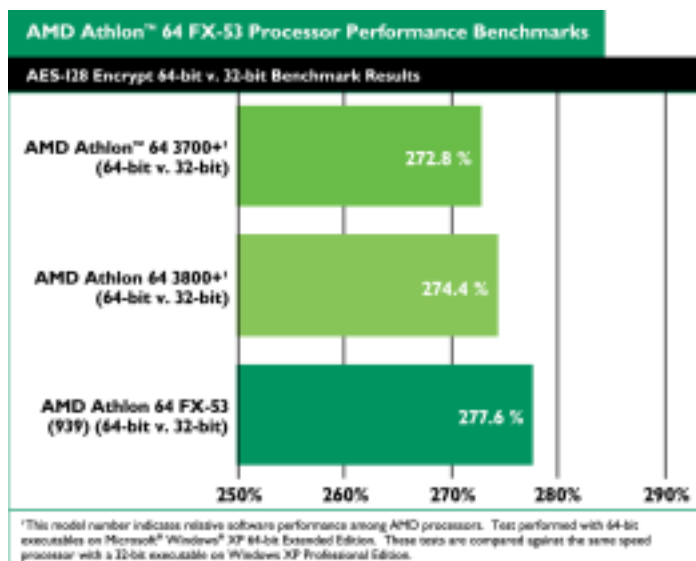


Table 35. AES-128 Decrypt 64-Bit

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	185.4%
AMD Athlon 64 3800+ <sup>1</sup>	182.6%
AMD Athlon 64 FX-53	194.2%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

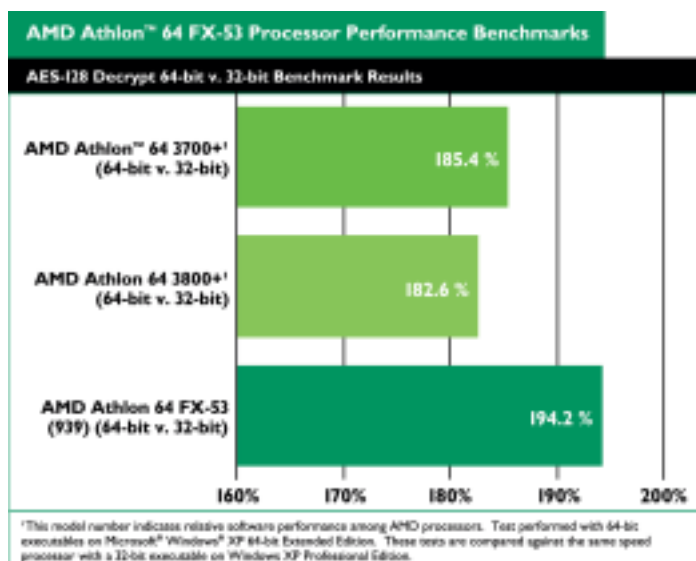


Table 36. RC4 Encrypt 64-Bit Benchmark

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	209.7%
AMD Athlon 64 3800+ <sup>1</sup>	210.3%
AMD Athlon 64 FX-53	215.3%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

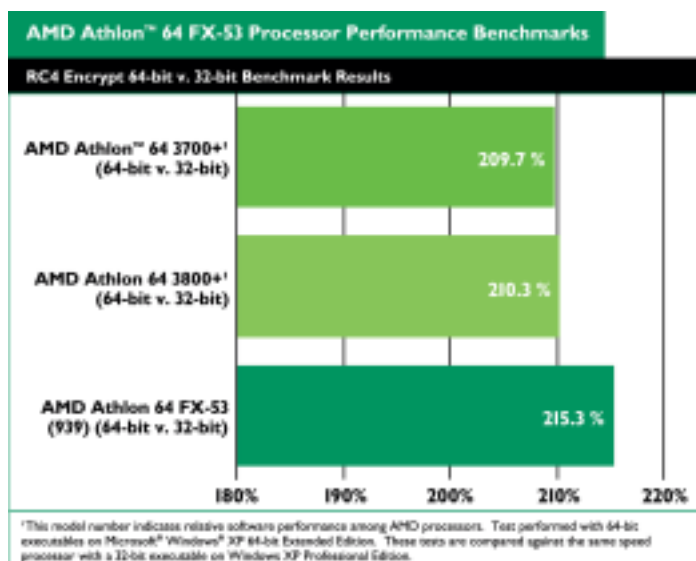


Table 37. RC4 Decrypt 64-Bit Benchmark

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	209.8%
AMD Athlon 64 3800+ <sup>1</sup>	211.0%
AMD Athlon 64 FX-53	216.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

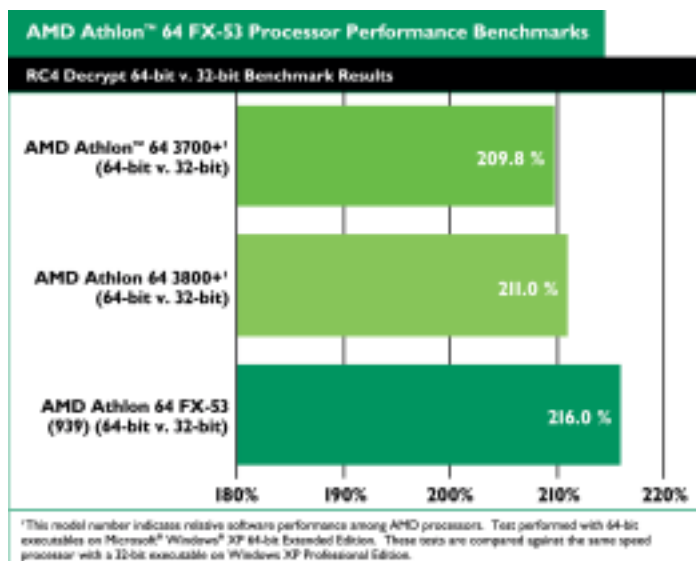


Table 38. Triple-DES Encrypt 64-Bit Benchmark

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	98.2%
AMD Athlon 64 3800+ <sup>1</sup>	101.2%
AMD Athlon 64 FX-53	102.8%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

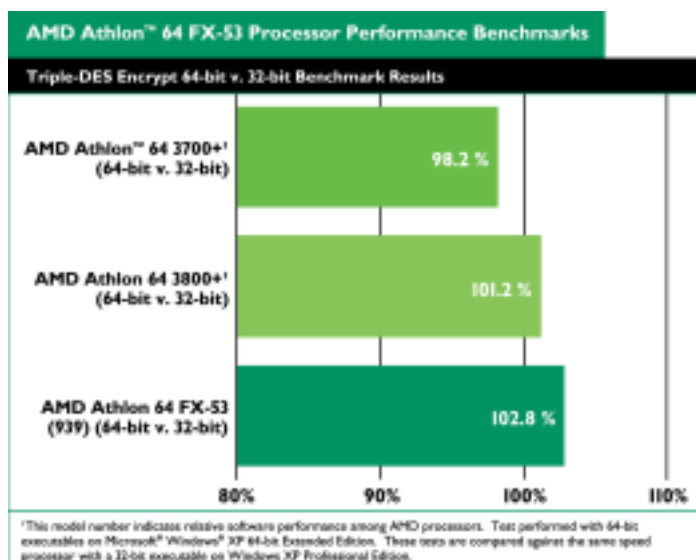
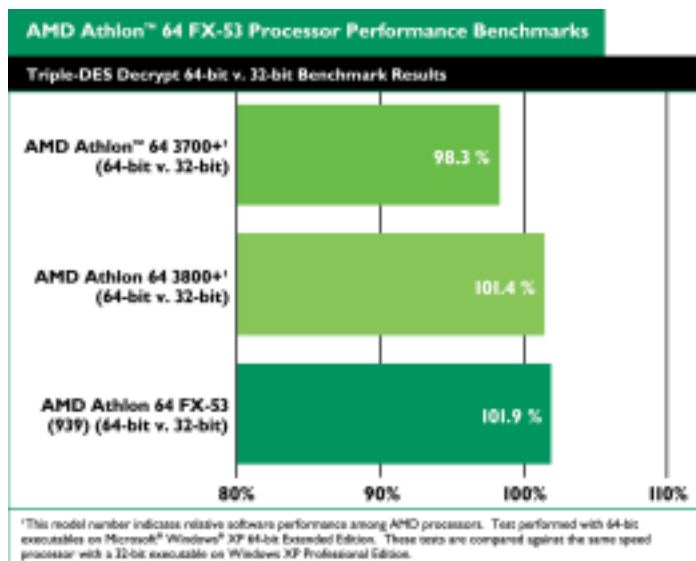


Table 39. Triple-DES Decrypt 64-Bit Benchmark

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	98.3%
AMD Athlon 64 3800+ <sup>1</sup>	101.4%
AMD Athlon 64 FX-53	101.9%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.

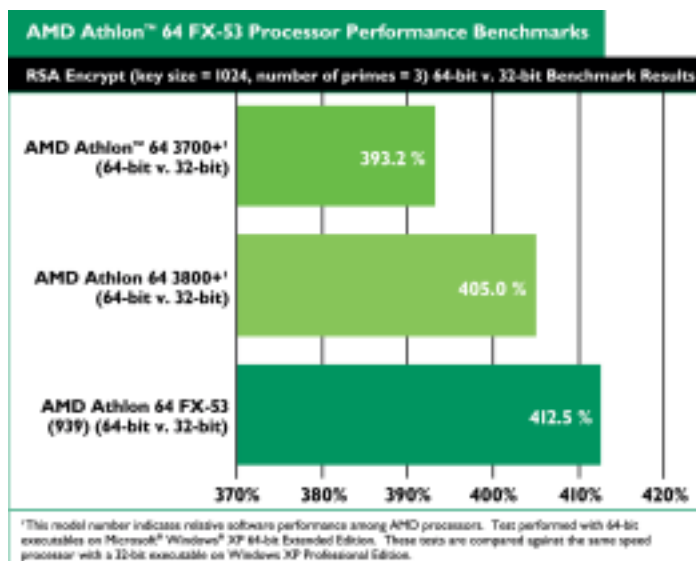




**Table 40. RSA Encrypt (key size = 1024, number of Primes =3) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	393.2%
AMD Athlon 64 3800+ <sup>1</sup>	405.0%
AMD Athlon 64 FX-53	412.5%

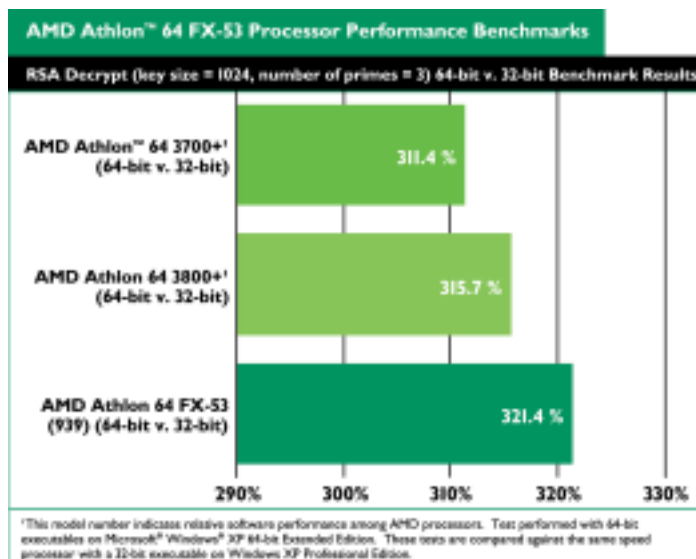
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 41. RSA Decrypt (key size = 1024, number of Primes =3) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	311.4%
AMD Athlon 64 3800+ <sup>1</sup>	315.7%
AMD Athlon 64 FX-53	321.4%

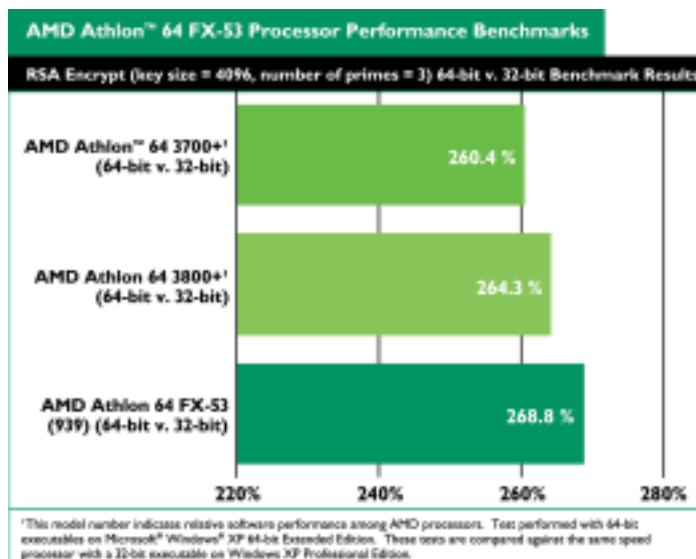
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 42. RSA Encrypt (key size = 4096, number of Primes =3) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	260.4%
AMD Athlon 64 3800+ <sup>1</sup>	264.3%
AMD Athlon 64 FX-53	268.8%

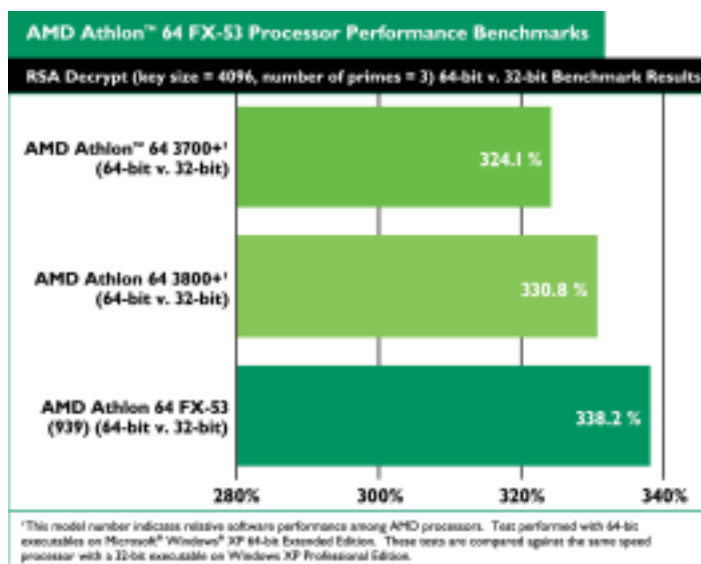
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 43. RSA Decrypt (key size = 4096, number of Primes =3) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	324.1%
AMD Athlon 64 3800+ <sup>1</sup>	330.8%
AMD Athlon 64 FX-53	338.2%

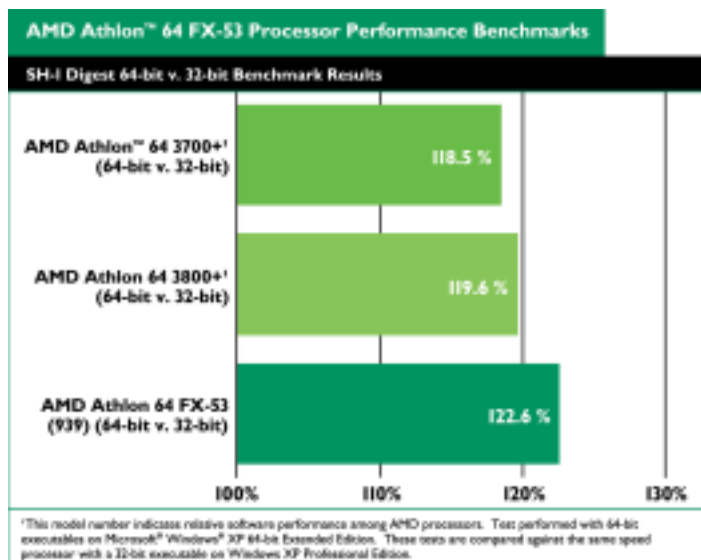
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 44. SH-1 Digest 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	118.5%
AMD Athlon 64 3800+ <sup>1</sup>	119.6%
AMD Athlon 64 FX-53	122.6%

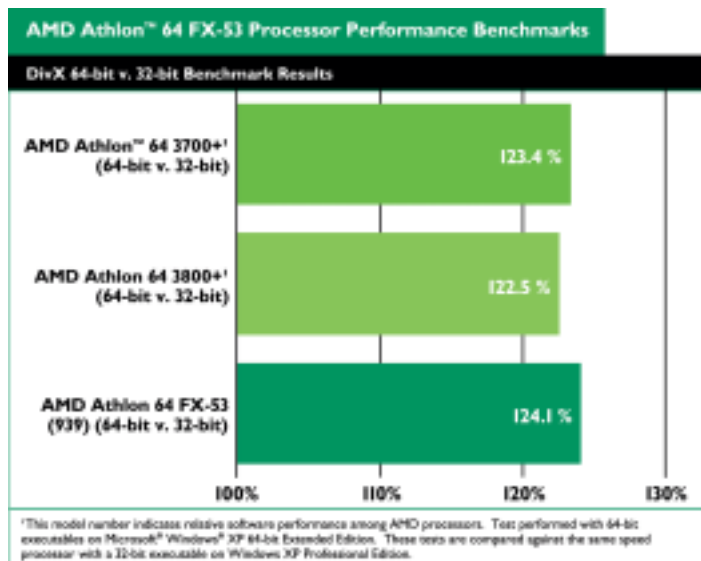
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 45. DivX 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	123.4%
AMD Athlon 64 3800+ <sup>1</sup>	122.5%
AMD Athlon 64 FX-53	124.1%

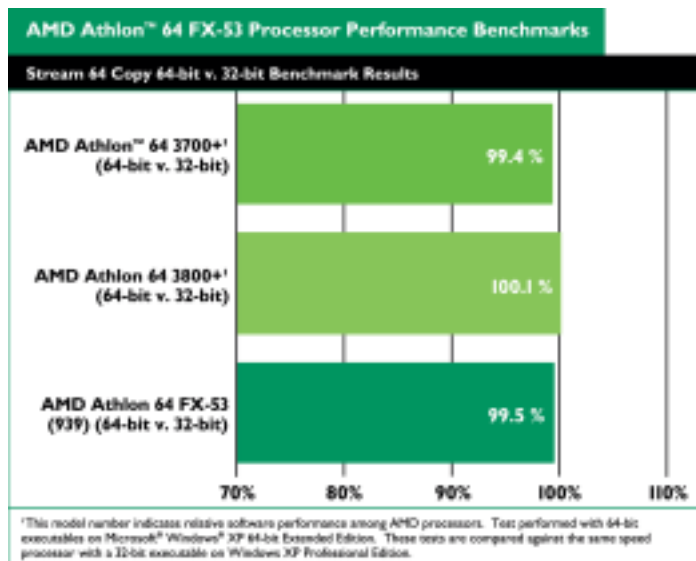
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 46. Stream 64 Copy (MB/s) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	99.4%
AMD Athlon 64 3800+ <sup>1</sup>	100.1%
AMD Athlon 64 FX-53	99.5%

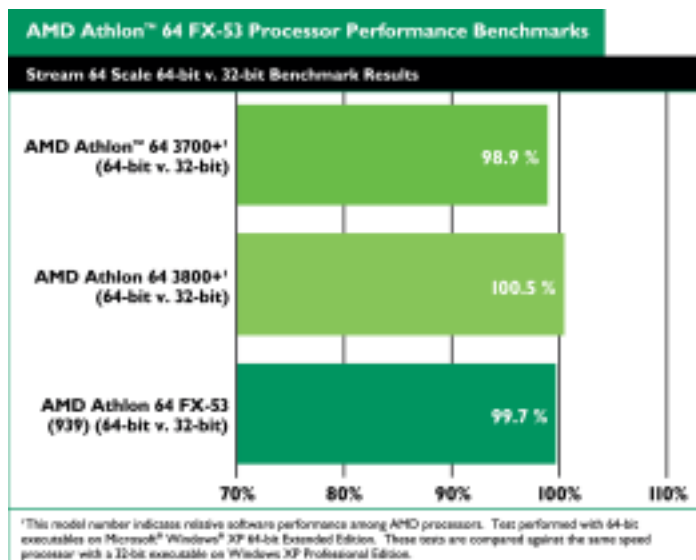
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 47. Stream 64 Scale (MB/s) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	98.9%
AMD Athlon 64 3800+ <sup>1</sup>	100.5%
AMD Athlon 64 FX-53	99.7%

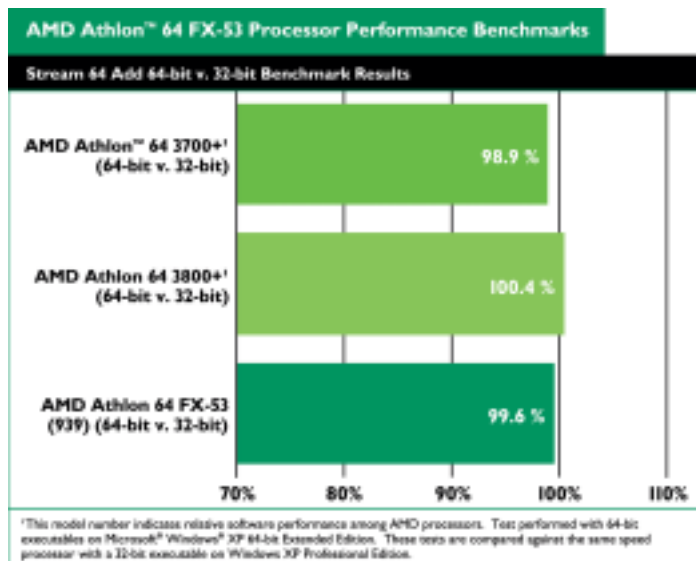
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 48. Stream 64 Add (MB/s) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	98.9%
AMD Athlon 64 3800+ <sup>1</sup>	100.4%
AMD Athlon 64 FX-53	99.6%

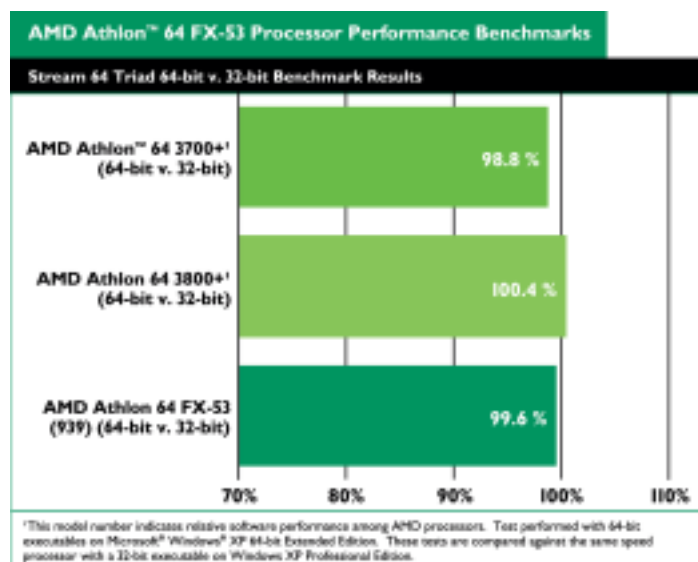
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 49. Stream 64 Triad (MB/s) 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	98.8%
AMD Athlon 64 3800+ <sup>1</sup>	100.4%
AMD Athlon 64 FX-53	99.6%

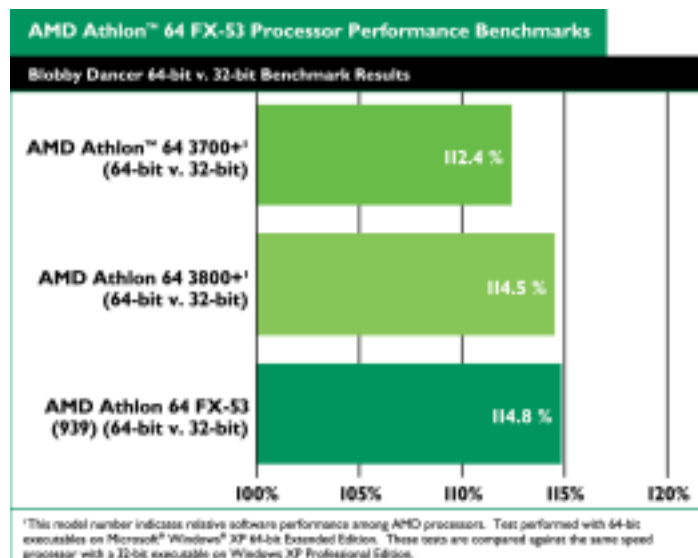
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 50. Blobby Dancer 64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	112.4%
AMD Athlon 64 3800+ <sup>1</sup>	114.5%
AMD Athlon 64 FX-53	114.8%

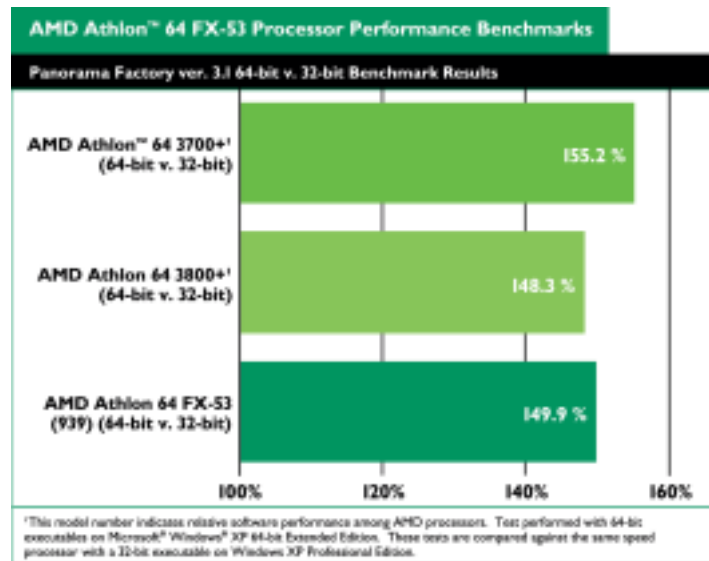
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 51. Panorama Factory Ver. 3.1  
64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	155.2%
AMD Athlon 64 3800+ <sup>1</sup>	148.3%
AMD Athlon 64 FX-53	149.9%

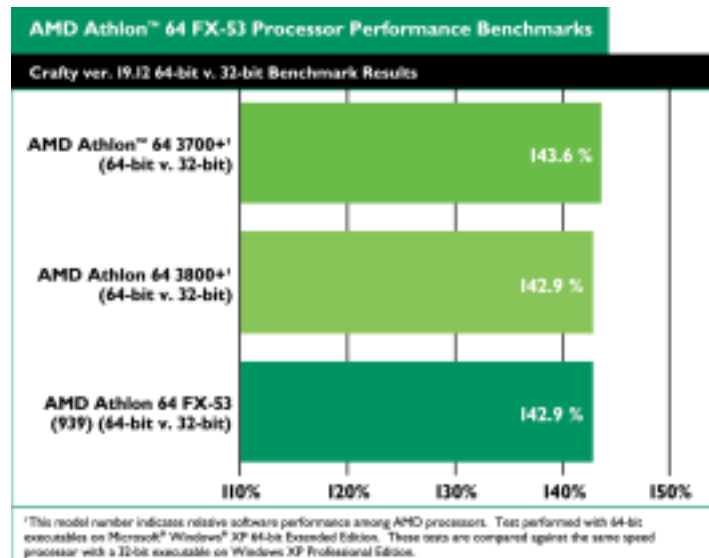
<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



**Table 52. Crafty Factory Ver. 19.12  
64-Bit Benchmark**

Processor	Result
AMD Athlon™ 64 3700+ <sup>1</sup>	143.6%
AMD Athlon 64 3800+ <sup>1</sup>	142.9%
AMD Athlon 64 FX-53	142.9%

<sup>1</sup>This model number indicates relative software performance among AMD processors. Test performed with 64-bit executables on Microsoft® Windows® XP 64-bit Extended Edition. These tests are compared against the same speed processor with a 32-bit executable on Windows XP Professional Edition.



## AMD's 32-Bit Performance Results

Table 53. MiniGzip 32-Bit Benchmark

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	7.72	77.5%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	7.87	76.1%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	7.75	77.3%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	7.81	76.7%
AMD Athlon 64 FX-53 (32-bit)	7.75	77.3%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	7.67	78.1%
Intel Pentium® 4 Extreme Edition 3.4 GHz	5.98	100.1%
Intel Pentium 4 3.4 GHz	5.99	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.  
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

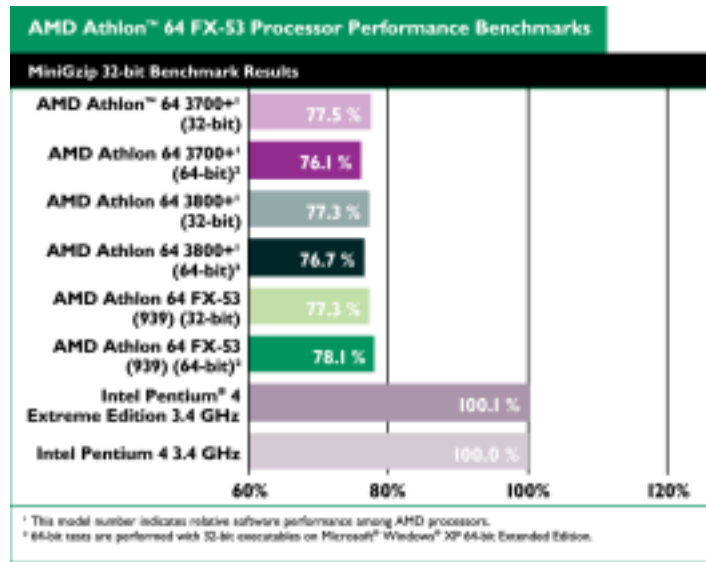
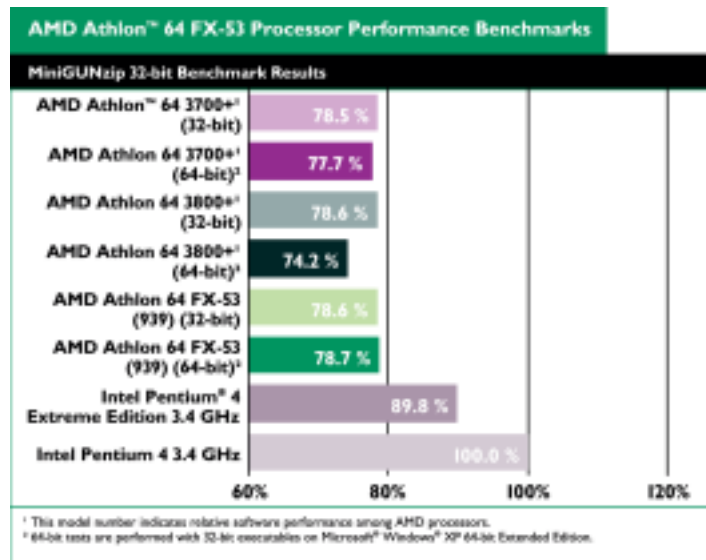


Table 54. MiniGUNzip 32-Bit Benchmark

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	0.76	78.5%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	0.77	77.7%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	0.76	78.6%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	0.81	74.2%
AMD Athlon 64 FX-53 (32-bit)	0.76	78.6%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	0.76	78.7%
Intel Pentium® 4 Extreme Edition 3.4 GHz	0.67	89.8%
Intel Pentium 4 3.4 GHz	0.60	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.  
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.





**Table 55. AES-128 Encrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	4.90	48.7%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	4.92	48.5%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	4.90	48.7%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	4.88	48.9%
AMD Athlon 64 FX-53 (32-bit)	4.90	48.7%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	4.83	49.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	2.36	101.1%
Intel Pentium 4 3.4 GHz	2.39	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 56. AES-128 Decrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	4.49	49.5%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	4.48	49.6%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	4.47	49.8%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	4.46	49.8%
AMD Athlon 64 FX-53 (32-bit)	4.47	49.8%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	4.42	50.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	2.22	100.0%
Intel Pentium 4 3.4 GHz	2.22	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

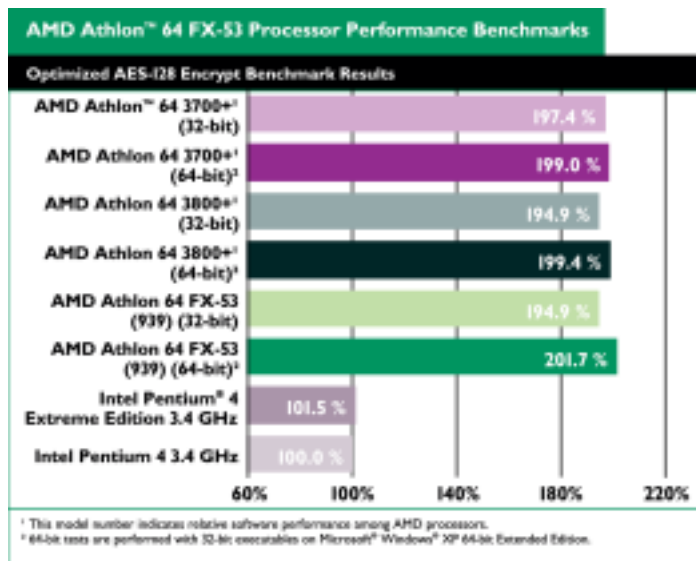
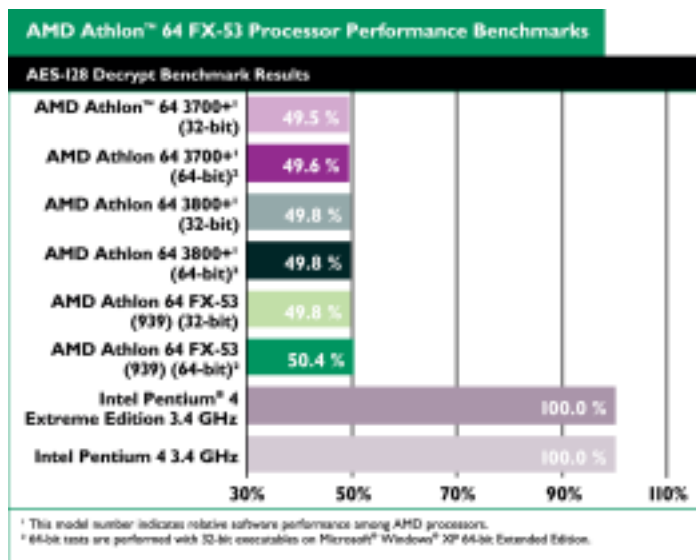
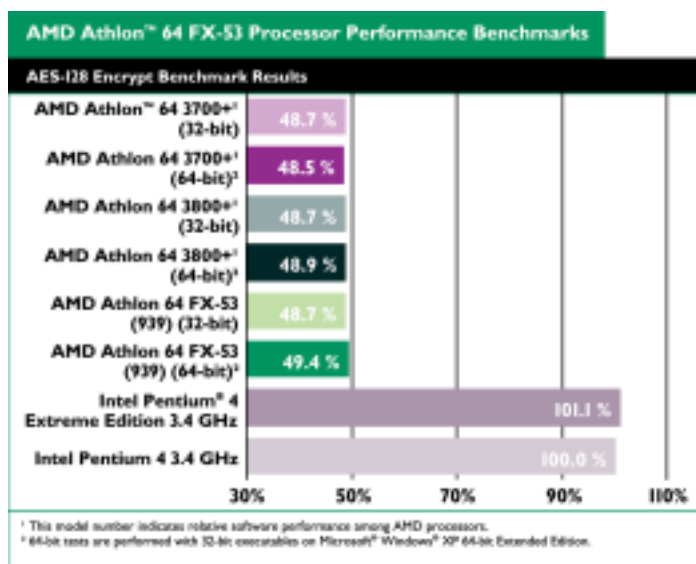
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 57. Optimized AES-128 Encrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.24	197.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.22	199.0%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.29	194.9%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.21	199.4%
AMD Athlon 64 FX-53 (32-bit)	3.29	194.9%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.18	201.7%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.31	101.5%
Intel Pentium 4 3.4 GHz	6.41	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

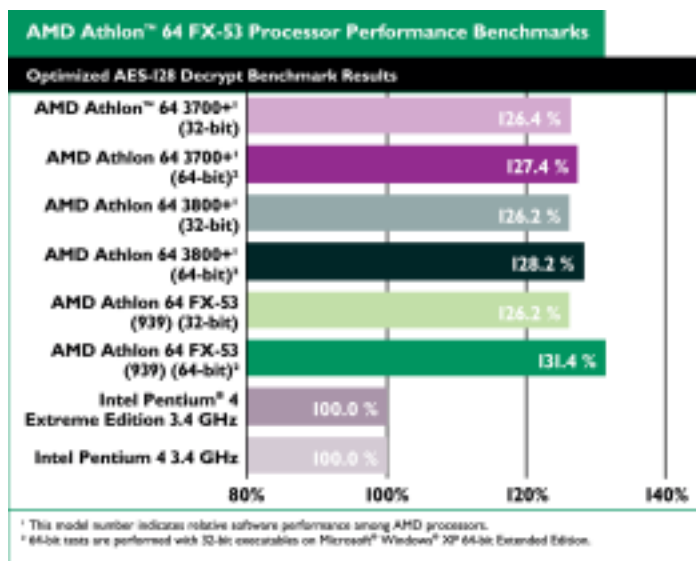


**Table 58. Optimized AES-128 Decrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.24	126.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.21	127.4%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.25	126.2%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.19	128.2%
AMD Athlon 64 FX-53 (32-bit)	3.25	126.2%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.11	131.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	4.09	100.0%
Intel Pentium 4 3.4 GHz	4.09	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

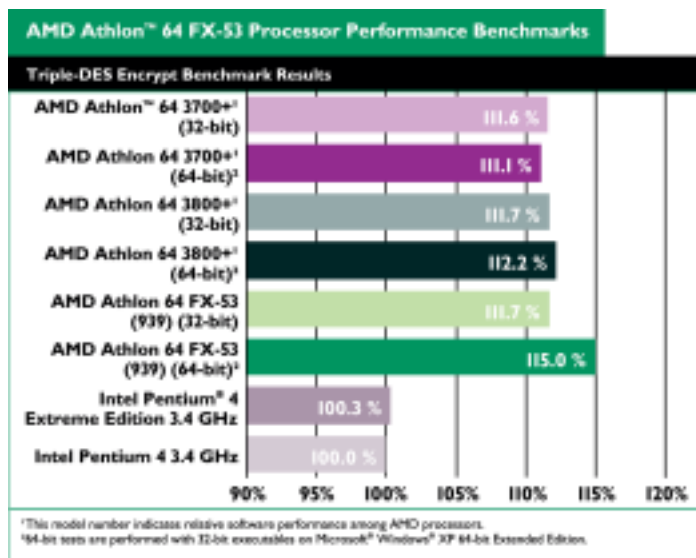


**Table 59. Triple-DES Encrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	6.28	111.6%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	6.31	111.1%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	6.28	111.7%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	6.25	112.2%
AMD Athlon 64 FX-53 (32-bit)	6.28	111.7%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	6.09	115.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.99	100.3%
Intel Pentium 4 3.4 GHz	7.01	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

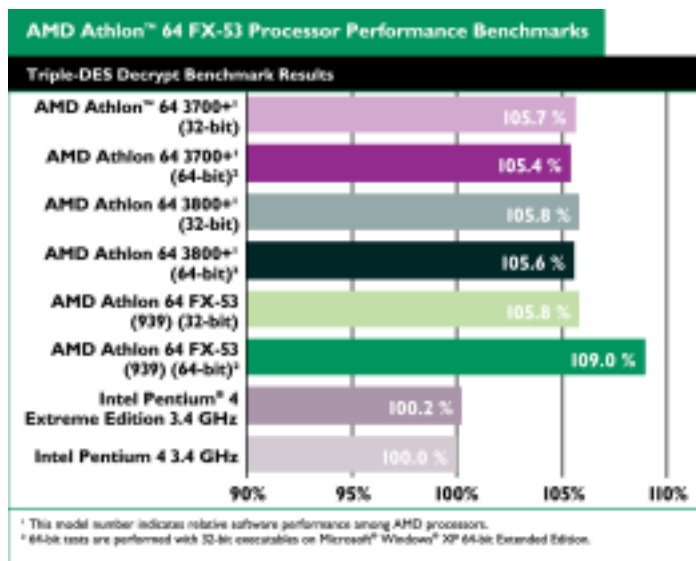


**Table 60. Triple-DES Decrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	6.29	105.7%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	6.31	105.4%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	6.29	105.8%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	6.30	105.6%
AMD Athlon 64 FX-53 (32-bit)	6.29	105.8%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	6.10	109.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.64	100.2%
Intel Pentium 4 3.4 GHz	6.65	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.





**Table 61. Optimized Triple-DES Encrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	6.41	103.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	6.39	103.7%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	6.31	105.0%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	6.30	105.2%
AMD Athlon 64 FX-53 (32-bit)	6.25	106.0%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	6.18	107.2%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.61	100.2%
Intel Pentium 4 3.4 GHz	6.63	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 62. Optimized Triple-DES Decrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	6.27	105.7%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	6.27	105.7%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	6.27	105.7%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	6.23	106.3%
AMD Athlon 64 FX-53 (32-bit)	6.27	105.7%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	6.09	108.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.61	100.2%
Intel Pentium 4 3.4 GHz	6.63	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 63. RC4 Encrypt (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.81	56.0%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.82	55.8%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.81	56.0%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.80	56.2%
AMD Athlon 64 FX-53 (32-bit)	3.81	56.0%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.71	57.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	2.13	100.2%
Intel Pentium 4 3.4 GHz	2.14	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

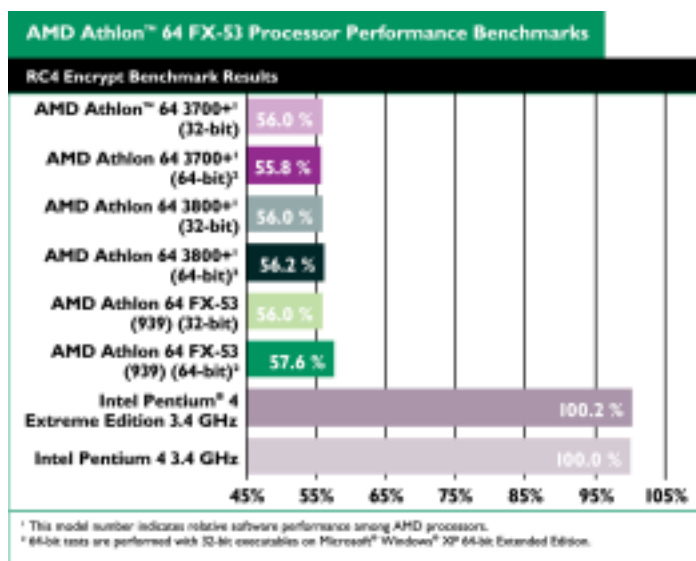
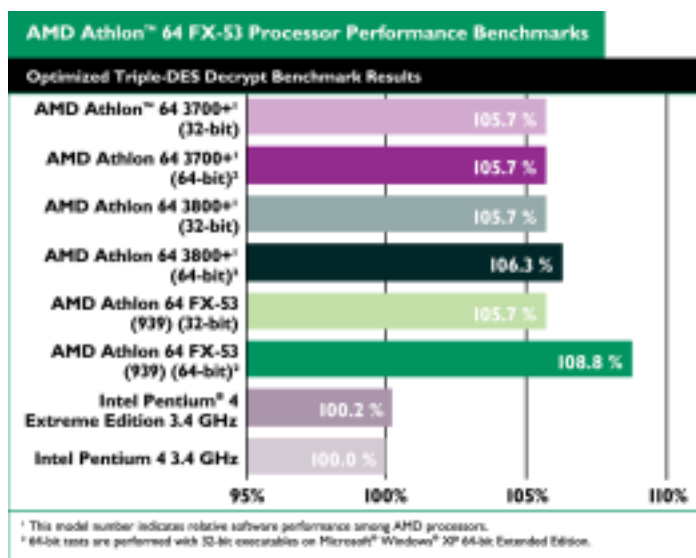
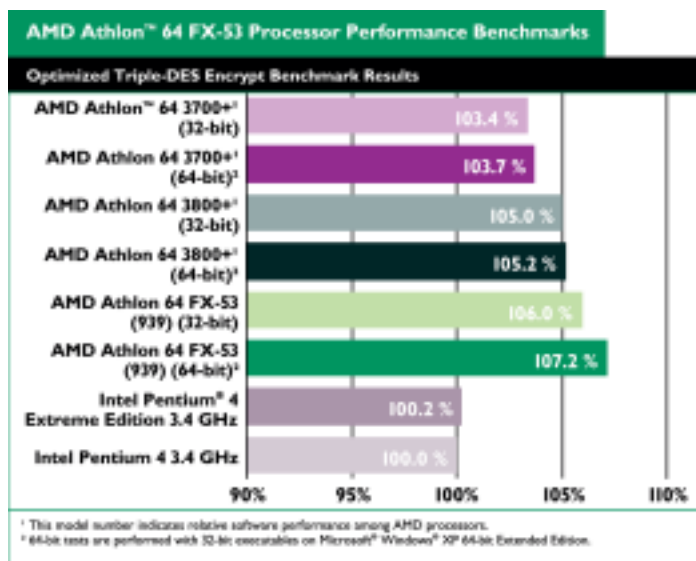
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.


Table 64. RC4 Decrypt (sec) Benchmark

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.81	56.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.82	56.3%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.81	56.4%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.80	56.6%
AMD Athlon 64 FX-53 (32-bit)	3.81	56.4%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.71	58.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	2.14	100.5%
Intel Pentium 4 3.4 GHz	2.15	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.  
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

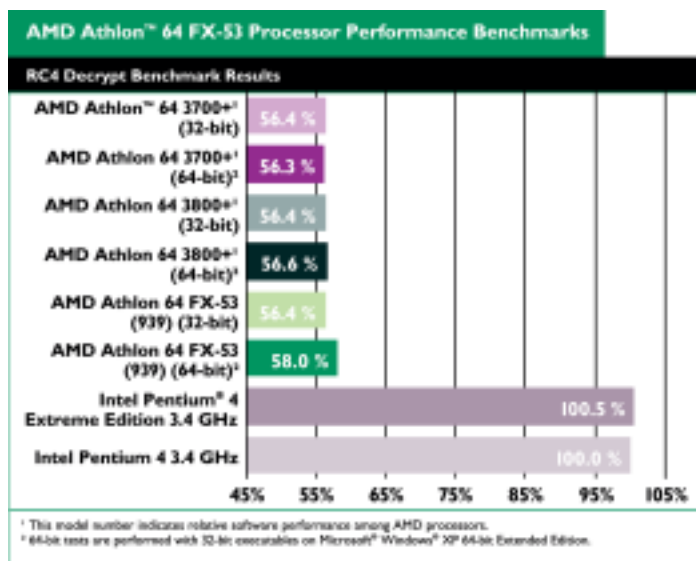


Table 65. Optimized RC4 Encrypt (sec) Benchmark

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2.06	256.0%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2.06	255.3%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	2.06	256.0%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	2.05	257.3%
AMD Athlon 64 FX-53 (32-bit)	2.06	256.0%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	2.00	263.3%
Intel Pentium® 4 Extreme Edition 3.4 GHz	5.25	100.4%
Intel Pentium 4 3.4 GHz	5.27	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.  
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

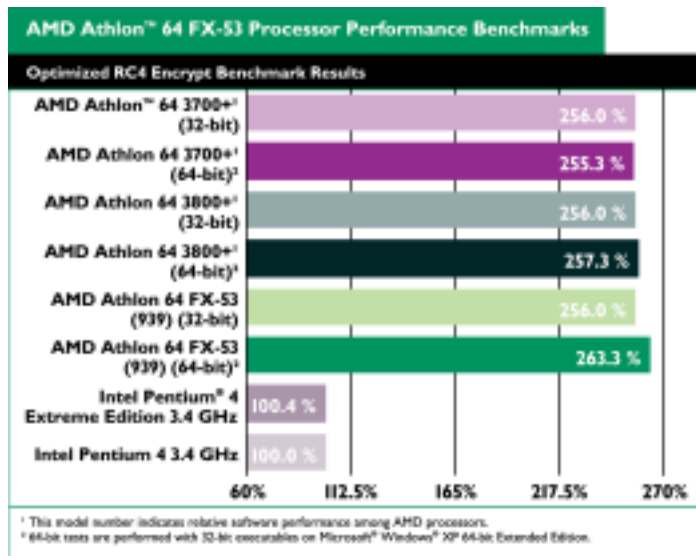
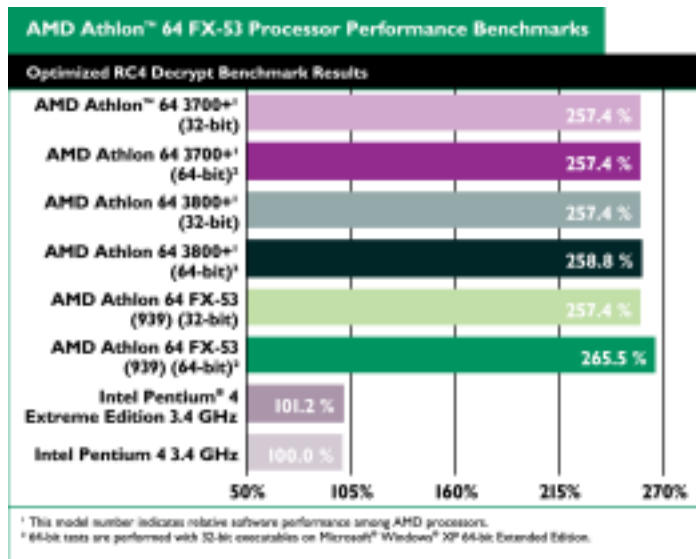


Table 66. Optimized RC4 Decrypt (sec) Benchmark

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2.06	257.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2.06	257.4%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	2.06	257.4%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	2.05	258.8%
AMD Athlon 64 FX-53 (32-bit)	2.06	257.4%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	2.00	265.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	5.23	101.2%
Intel Pentium 4 3.4 GHz	5.30	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.  
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.



**Table 67. RSA Encrypt key size = 1024, number of Primes = 3 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	5.82	136.1%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	5.88	134.6%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	5.84	135.5%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	5.82	136.1%
AMD Athlon 64 FX-53 (32-bit)	5.84	135.5%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	5.64	140.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	8.07	98.1%
Intel Pentium 4 3.4 GHz	7.92	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 68. RSA Decrypt key size = 1024, number of Primes = 3 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.68	102.0%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.71	101.1%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.68	102.0%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.69	101.8%
AMD Athlon 64 FX-53 (32-bit)	3.68	102.0%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.59	104.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3.78	99.3%
Intel Pentium 4 3.4 GHz	3.76	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

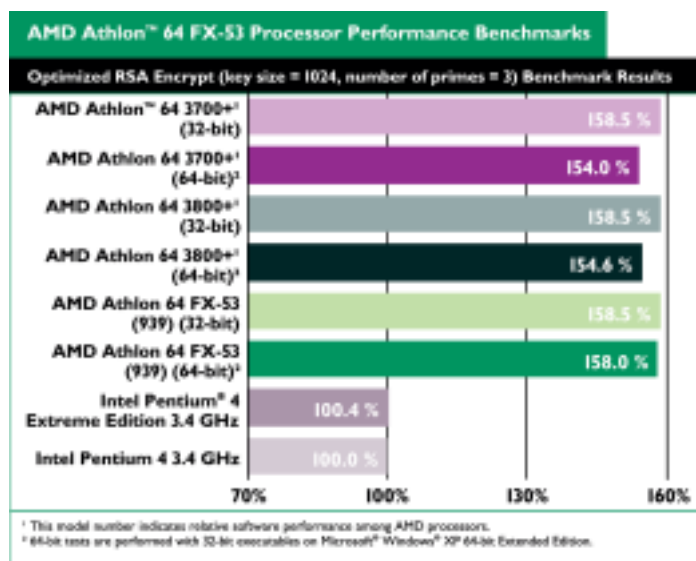
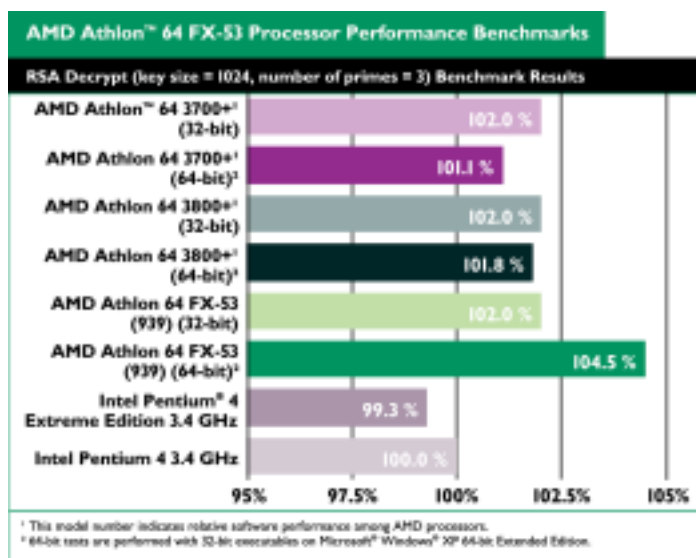
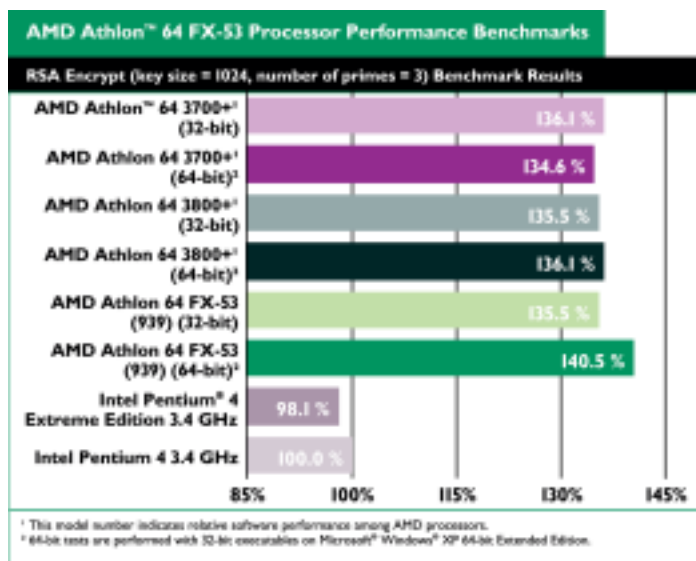
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 69. Optimized RSA Encrypt key size = 1024, number of Primes = 3 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2.85	158.5%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2.93	154.0%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	2.85	158.5%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	2.92	154.6%
AMD Athlon 64 FX-53 (32-bit)	2.85	158.5%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	2.86	158.0%
Intel Pentium® 4 Extreme Edition 3.4 GHz	4.50	100.4%
Intel Pentium 4 3.4 GHz	4.52	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.



**Table 70. Optimized RSA Decrypt key size = 1024, number of Primes = 3 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2.43	260.8%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2.46	258.0%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	2.43	260.8%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	2.45	259.1%
AMD Athlon 64 FX-53 (32-bit)	2.43	260.8%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	2.39	265.9%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.33	100.2%
Intel Pentium 4 3.4 GHz	6.34	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 71. RSA Encrypt key size = 4096, number of Primes = 2 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.28	184.8%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.30	183.9%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.29	184.2%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.28	184.8%
AMD Athlon 64 FX-53 (32-bit)	3.29	184.2%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.20	189.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.03	100.5%
Intel Pentium 4 3.4 GHz	6.06	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

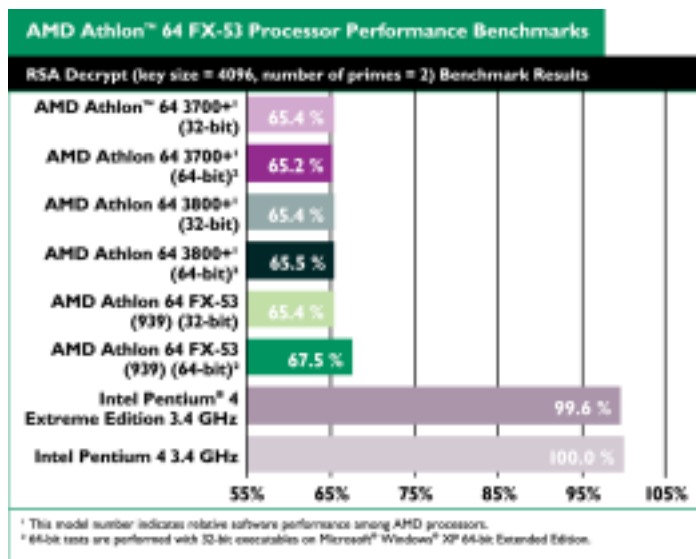
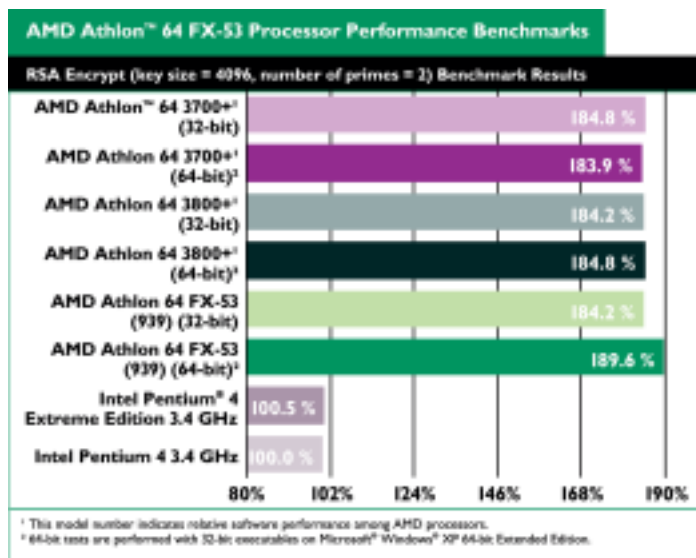
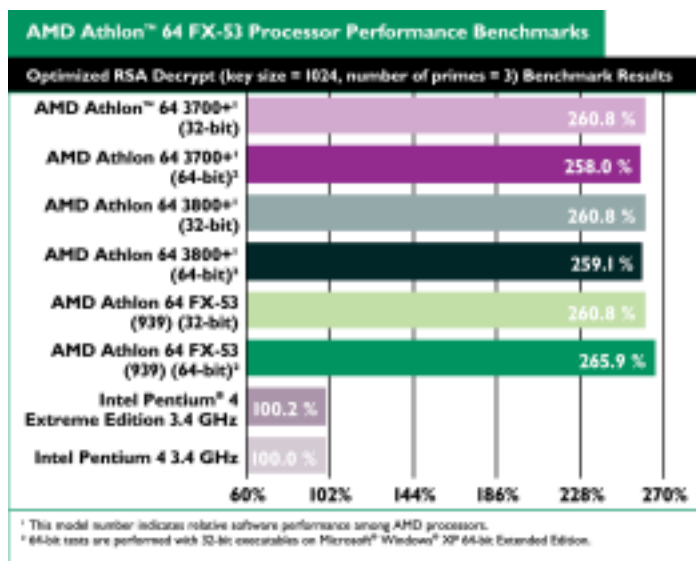
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 72. RSA Decrypt key size = 4096, number of Primes = 2 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	10.31	65.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	10.33	65.2%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	10.30	65.4%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	10.28	65.5%
AMD Athlon 64 FX-53 (32-bit)	10.30	65.4%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	9.98	67.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.77	99.6%
Intel Pentium 4 3.4 GHz	6.74	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.





**Table 73. Optimized RSA Encrypt key size = 4096, number of Primes = 2 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	4.12	148.5%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	4.14	148.0%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	4.12	148.5%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	4.11	148.9%
AMD Athlon 64 FX-53 (32-bit)	4.12	148.5%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	4.02	152.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	6.09	100.5%
Intel Pentium 4 3.4 GHz	6.12	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 74. Optimized RSA Decrypt key size = 4096, number of Primes = 2 (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	12.79	233.0%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	12.80	232.9%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	12.79	233.1%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	12.72	234.3%
AMD Athlon 64 FX-53 (32-bit)	12.79	233.1%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	12.43	239.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	29.71	100.3%
Intel Pentium 4 3.4 GHz	29.81	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

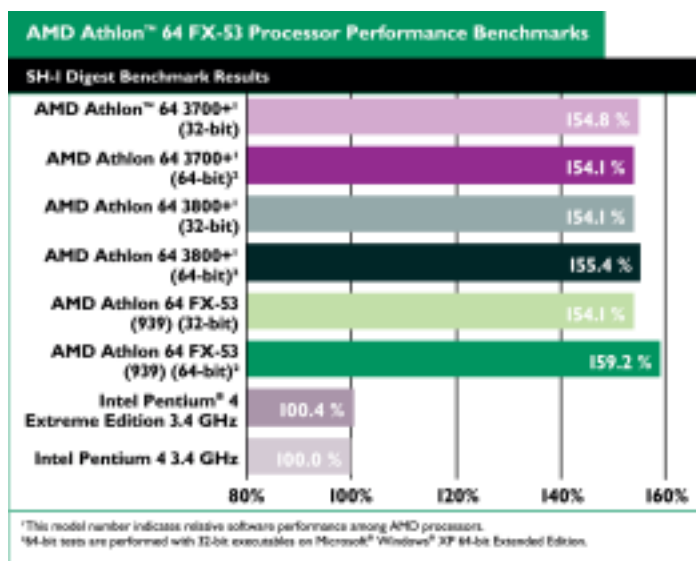
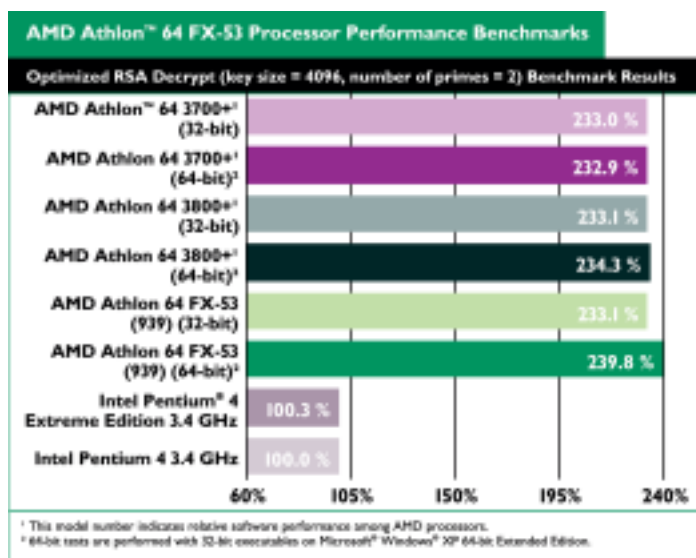
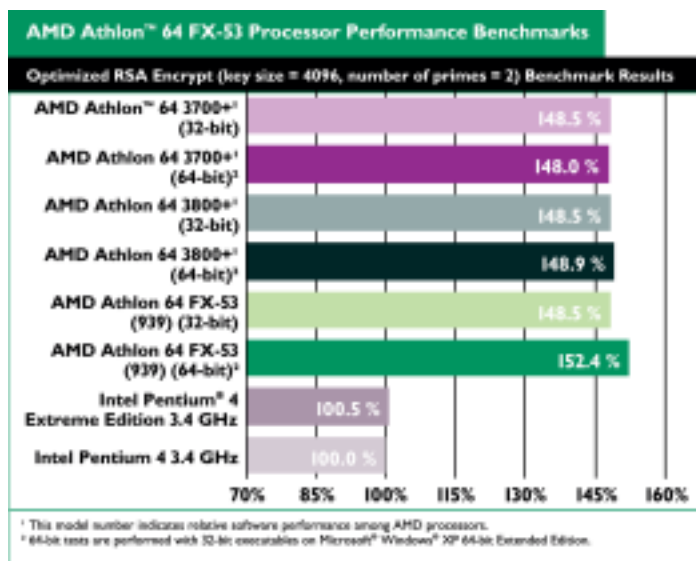
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 75. SH-1 Digest (sec) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.77	154.8%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.78	154.1%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.78	154.1%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.75	155.4%
AMD Athlon 64 FX-53 (32-bit)	3.78	154.1%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.66	159.2%
Intel Pentium® 4 Extreme Edition 3.4 GHz	5.81	100.4%
Intel Pentium 4 3.4 GHz	5.83	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.



**Table 76. Optimized SH-1 Digest (sec)  
Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	3.42	114.0%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	3.44	113.5%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	3.43	113.7%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	3.41	114.5%
AMD Athlon 64 FX-53 (32-bit)	3.43	113.7%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	3.34	116.9%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3.89	100.3%
Intel Pentium 4 3.4 GHz	3.90	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 77. DivX 32-Bit Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	11.60	92.9%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	10.80	99.8%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	10.40	103.6%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	10.10	106.7%
AMD Athlon 64 FX-53 (32-bit)	10.30	104.6%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	10.00	107.8%
Intel Pentium® 4 Extreme Edition 3.4 GHz	9.40	114.6%
Intel Pentium 4 3.4 GHz	10.78	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

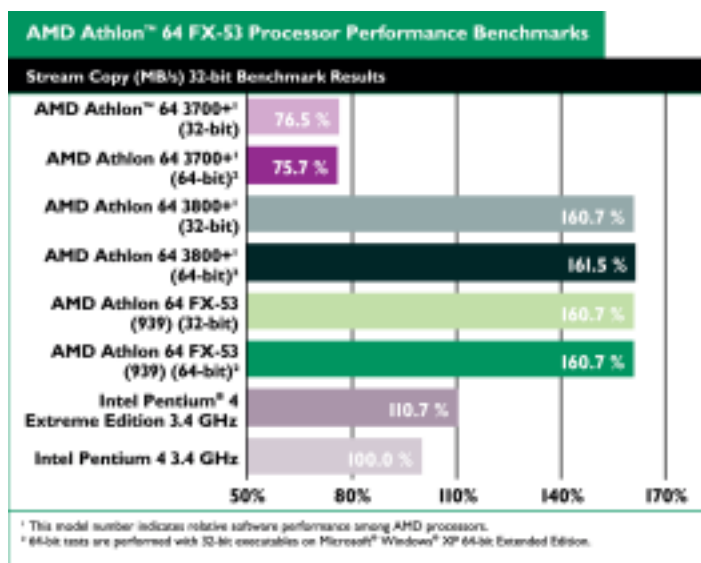
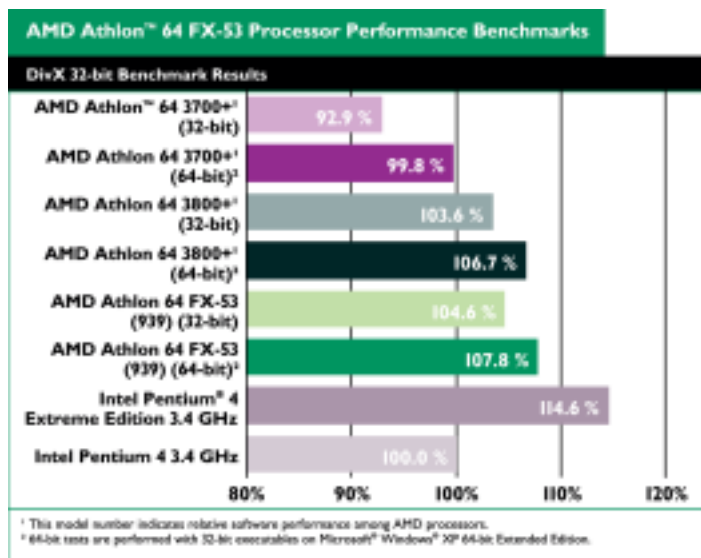
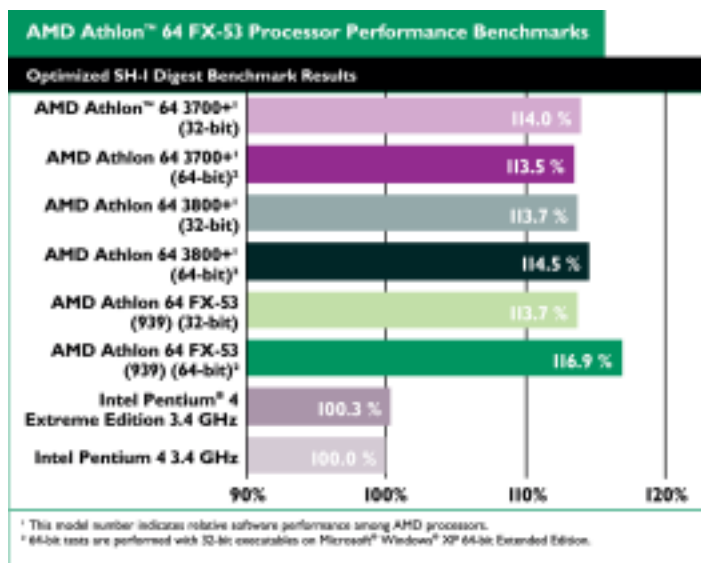
<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 78. Stream 32 Copy (MB/s)  
Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2617.26	76.5%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2589.11	75.7%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	5497.39	160.7%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	5524.84	161.5%
AMD Athlon 64 FX-53 (32-bit)	5497.39	160.7%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	5497.64	160.7%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3788.11	110.7%
Intel Pentium 4 3.4 GHz	3421.45	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.



**Table 79. Stream 32 Scale (MB/s) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2639.34	77.1%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2609.45	76.2%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	5491.60	160.5%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	5515.21	161.1%
AMD Athlon 64 FX-53 (32-bit)	5491.60	160.5%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	5490.47	160.4%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3767.57	110.1%
Intel Pentium 4 3.4 GHz	3422.42	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 80. Stream 32 Add (MB/s) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2748.28	83.1%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2721.72	82.3%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	5584.83	168.9%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	5596.99	169.3%
AMD Athlon 64 FX-53 (32-bit)	5584.83	168.9%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	5572.66	168.5%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3602.02	108.9%
Intel Pentium 4 3.4 GHz	3306.78	100.0%

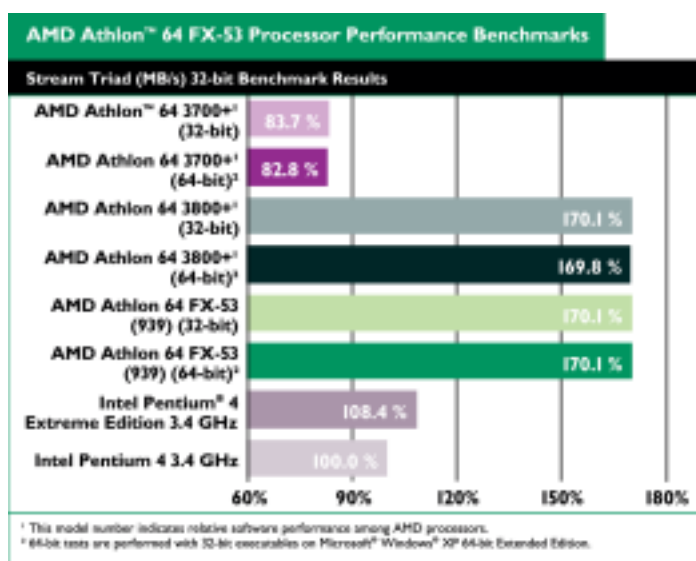
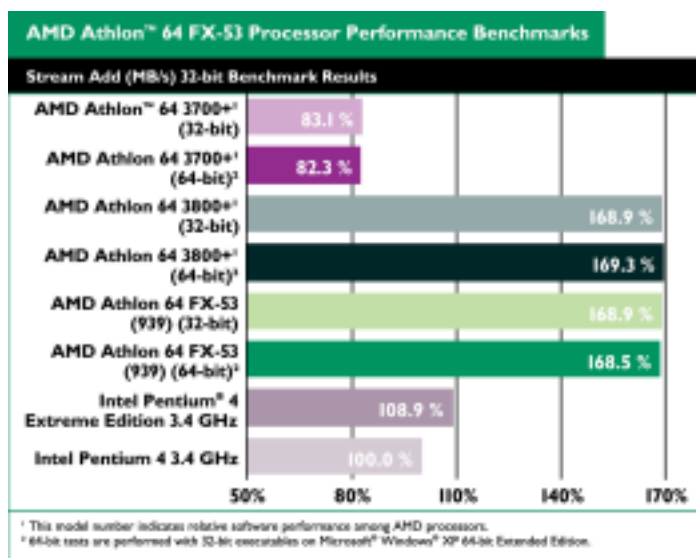
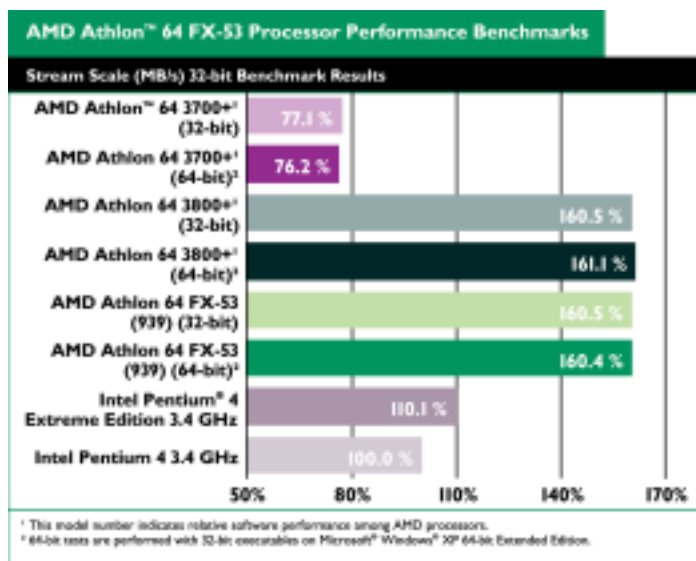
<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 81. Stream 32 Triad (MB/s) Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	2751.91	83.7%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2722.93	82.8%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	5595.72	170.1%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	5584.26	169.8%
AMD Athlon 64 FX-53 (32-bit)	5595.72	170.1%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	5595.72	170.1%
Intel Pentium® 4 Extreme Edition 3.4 GHz	3567.46	108.4%
Intel Pentium 4 3.4 GHz	3289.55	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup>64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.


**Table 82. Blobby Dancer 32-Bit Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	31.84	93.2%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	31.84	93.2%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	33.39	97.8%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	33.57	98.3%
AMD Athlon 64 FX-53 (32-bit)	33.39	97.8%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	33.69	98.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	35.52	104.0%
Intel Pentium 4 3.4 GHz	34.16	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup> 64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 83. Panorama Factory Ver. 3.1 32-Bit Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	134.63	112.4%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	86.75	174.4%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	133.97	113.0%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	90.34	167.5%
AMD Athlon 64 FX-53 (32-bit)	125.60	120.5%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	83.77	180.6%
Intel Pentium® 4 Extreme Edition 3.4 GHz	127.36	118.8%
Intel Pentium 4 3.4 GHz	151.33	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup> 64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

**Table 84. Crafty Ver. 19.12 32-Bit Benchmark**

Processor	Score	Result
AMD Athlon 64 3700+ <sup>1</sup> (32-bit)	1561246.00	129.3%
AMD Athlon 64 3700+ <sup>1</sup> (64-bit) <sup>2</sup>	2242606.00	185.7%
AMD Athlon 64 3800+ <sup>1</sup> (32-bit)	1569824.00	130.0%
AMD Athlon 64 3800+ <sup>1</sup> (64-bit) <sup>2</sup>	2242606.00	185.7%
AMD Athlon 64 FX-53 (32-bit)	1569824.00	130.0%
AMD Athlon 64 FX-53 (64-bit) <sup>2</sup>	2242606.00	185.7%
Intel Pentium® 4 Extreme Edition 3.4 GHz	1223240.00	101.3%
Intel Pentium 4 3.4 GHz	1207557.00	100.0%

<sup>1</sup>This model number indicates relative software performance among AMD processors.

<sup>2</sup> 64-bit tests are performed with 32-bit executables on Microsoft® Windows® XP 64-bit Extended Edition.

